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TECHNICAL EQUIPMENT REPORT NO. 5100-II

MAY 1960

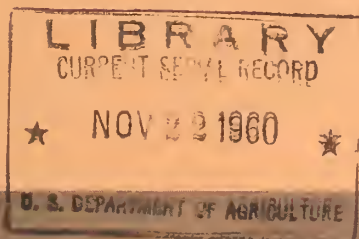
TANK INSTALLATION IN T.B.M. AIR TANKER

BY

ARCADIA EQUIPMENT DEVELOPMENT CENTER

FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE

ARCADIA, CALIFORNIA



✓ FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON, D. C.



SUMMARY

In 1954, a Navy Torpedo Bomber was first used experimentally on a forest fire with weather balloon water tanks. In 1956, the Forest Service obtained several surplus TBM's for further trials and one of these aircraft was fitted with a tank and equipment for "cascading" or dropping liquids on fires.

The tank and equipment described in this report is for use in the TBM-3 "Avenger" airplane and has a capacity of 600 gallons. The tank is arranged to fit within the bomb bay and is equipped with two hinged doors along the bottom. Each door seals half of the tank longitudinally and can be released by the pilot to quickly dump the contents of either or both compartments. The doors are equipped with automatic retracting or closing devices for returning them to the closed position after opening. Emergency dump gates are located at the after end of the tank for jettisoning of contents should doors fail. Manual and electric triggering of door release valves are provided.



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TECHNICAL EQUIPMENT REPORT NO. 5100-11

TANK INSTALLATION IN TBM AIR TANKER

By

Arcadia Equipment Development Center

Forest Service, U. S. Department of Agriculture

Arcadia, California

May 1960

HISTORY

For many years aerial bombing of fire targets consisted of dropping liquids contained in cans, drums, bags, or wing tanks. It was found that impact force shock waves often scattered the fire over a larger area and there was always serious danger to ground personnel.

In 1954, a Navy TBM was employed on field tests and on one large fire. A weather balloon was placed in each bomb bay section and filled with water. Each of the two sections carried 300 gallons of water and as the special plywood doors opened, the balloons burst and the load was released to cascade down on the target. Crude as it was, this means of application showed some promise.

In the year or two to follow, converted Stearman aircraft normally used in agricultural dusting and spraying were used in tests and on fires. From the beginning, these small aircraft did a notable job; however, many foresters felt there was a place for a medium-sized air tanker for work on more difficult assignments.

Figure 1.- Borate fire retardant line, Inaja Fire, Nov. 1956, Cleveland N. F.





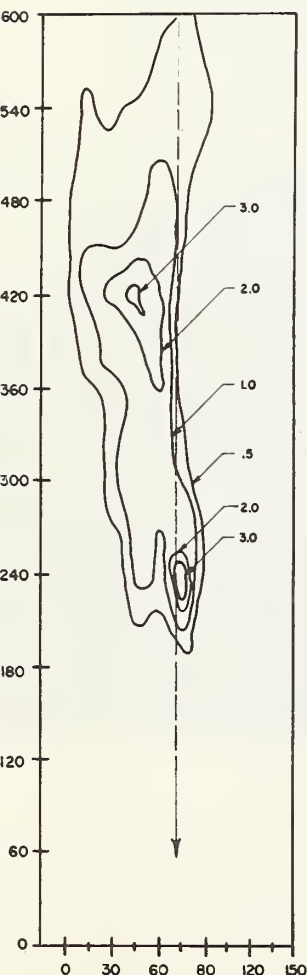
Figure 2.- TBM Air Tanker dropping 440 gallons of water.

In the fall of 1956, the Forest Service obtained several Navy TBM's for use as air tankers. The following spring, field men and engineers from the California Division of Forestry and the U. S. Forest Service engaged in a combined effort to design and construct a 440-gallon tank installation for one of the aircraft. The construction and final assembly phases of the work was done in the State shops at Davis, California.

DROP PATTERNS

Figure 3.- (below)

Forest Service TBM,
400 gallons, 100
mph @ 100 feet.



It was apparent that equipment used for agricultural spraying laid down patterns far too light for fire suppression work. On converted Stearman aircraft, dump gates were enlarged substantially. In fact, for work in timber types requiring average to heavy concentrations, most of the tank bottom area was converted into door space.

Tests conducted with the first air tanker in 1957, indicated that a 400-gallon drop from a TBM at 100 mph airspeed at 100 feet above the terrain resulted in a pattern about 400 feet long. (See figure 3).

The size of the pattern was altered by varying the airspeed or the height of the pass.

Effect of wind on drift of drops was found to be an important factor. For example; a 10 mph side wind at 100 feet was found to shift the whole pattern about half its width from the drop line.

Later tests conducted by the Southeastern Forest Experiment Station in North Carolina and Georgia indicated "over-all pattern size for 220-, double 220-, or 400-gallon Kaolin calibration drops made from altitudes between 50 and 100 feet above the ground was about 370 feet by 75 feet in all fuel types. Patterns were fairly uniform with no gaps or low concentration".

From these tests, it appeared that door openings of 1,000 square inches would give acceptable drop patterns for each 200 to 300 gallons. Working missions on a number of fires established the place of the TBM in the air fleet.

As gross weight operating limitations were later raised, the tank capacity was enlarged to 600 gallons by redesigning and modifying the 400-gallon unit. The tank and doors were enlarged along with several other improvements. The specifications and drawings accompanying this report cover this 600-gallon model.

DESIGN AND DETAILS OF 600-GALLON TANK

Figure 4.- Bomb bay doors and fittings removed from the TBM.

The light colored members are fastened to aircraft bulkheads and can be easily installed. Longitudinal angles on each side mate with angles on tank sides which permits easy fastening and adjustment. The existing hydraulic system in the aircraft was used as a power supply for door actuation.

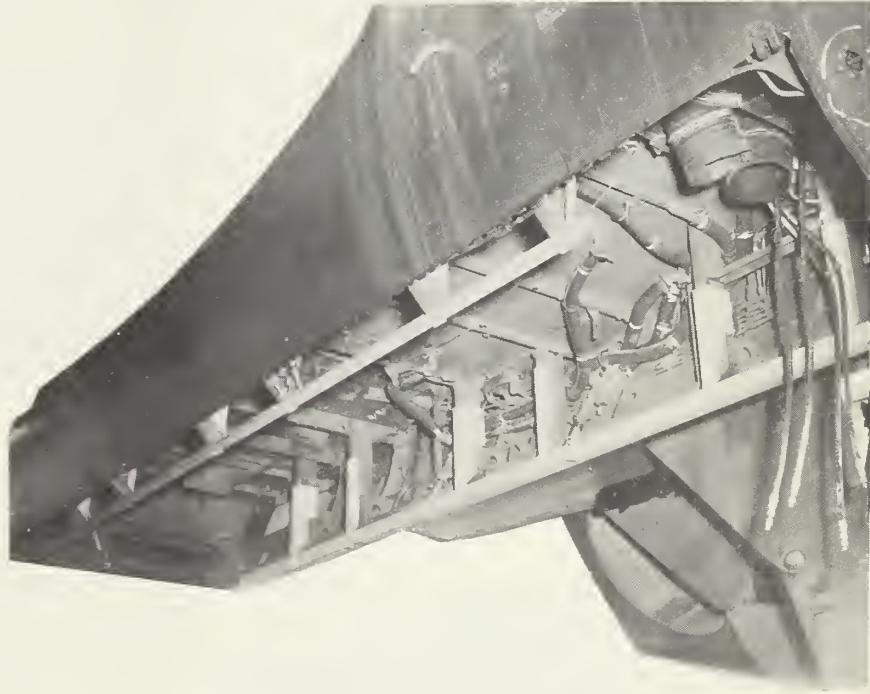


Figure 5.- Tank and compartments.

A two-compartment aluminum tank of riveted, welded, and bolted construction was designed with a total maximum capacity of approximately 600 gallons in the final model. Note that the entire bottom of the tank opens into door area.

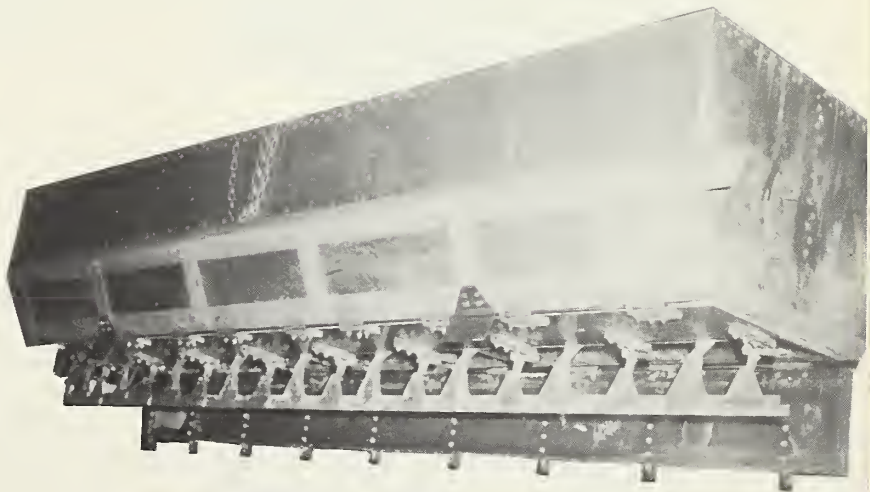




Figure 6.- Doors (gates)

The bottom of each 300-gallon compartment opening is 7-7/8 inches by 142-7/16 inches to permit a fast, clean freefall release of thick suppressants. In other words, one-half the tank capacity is discharged through an opening around 1,000 square inches in size.

Door hinges are of the offset type to eliminate any sliding action on the gasket as they are closed. The compression seal for the doors is formed into an endless loop from either cellular rubber or molded hollow circular cross section type material.



Figure 7.- Door actuating mechanism.

Hydraulic cylinders mounted on the front of the tank activate the mechanical linkage on the latches. Quick-release clamp type closure latches are used. The two-door compartments can be opened singly or simultaneously and can be closed in flight after the drop.

Figure 8.- Controls

Electrically operated valves and a selector switch are employed so that the gates can be triggered from the stick button. The doors are closed in flight by arms which are activated by cylinders connected in parallel with the opening cylinders. After closing, the indicator lights go out and the pilot reverses the selector valve to relock the latches. The closing arms are then returned to an open position.

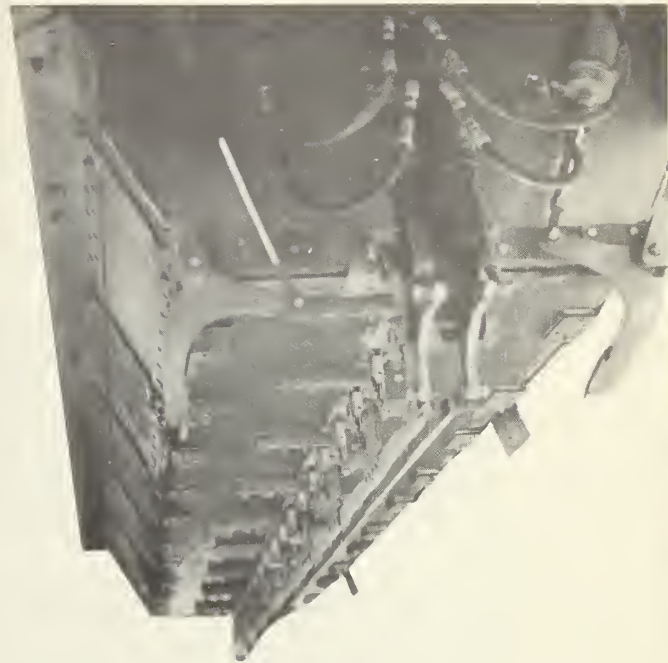
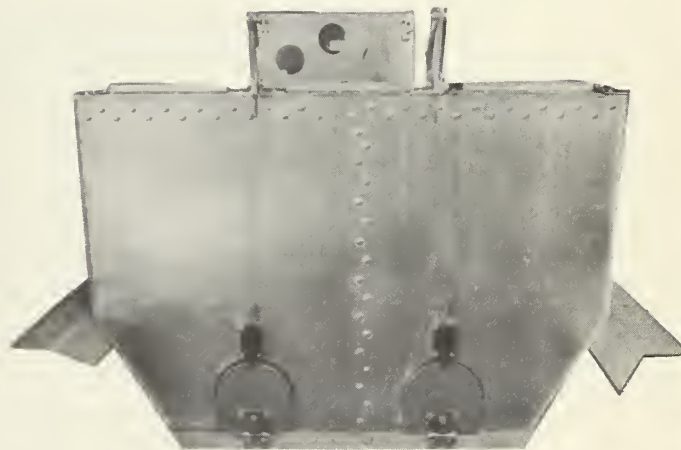


Figure 9.- Emergency drop doors

Two 3-inch emergency drop doors are located on the rear of the tank in case the main compartment doors should fail to open. They can be opened by manual pull handles located in the cockpit.



Fill tubes.- A fill tube opening is provided on each side of the fuselage just in front of the leading edge of the wing. This large fill tube reduces loading time and provides the necessary venting required for proper operation of the tank.

Float valve seal.- A float device closes the fill opening into the tank and prevents leakage out of the fill pipes during long dive maneuvers.

Inspections. - FAA certification on the tank installed in the TBM is under Part 8, CAR, Restricted Category.

Drawings. - Drawings for TBM Air Tanker Assembly, Numbers F-46-01 through F-46-10, are included in pages 9 through 18 inclusive of this report as reduced prints. Authorized contractors and cooperators working with the Forest Service can secure full-sized working drawings through the Arcadia Equipment Development Center, U. S. Forest Service, 701 N. Santa Anita Avenue, Arcadia, California.

Alterations and Modifications. - Several seasons' use of the tank installation described has led to several suggestions and alternatives in design which are not covered in detail in this report. Since one or more of these features may be important in certain areas and for specific assignments, these changes are listed briefly:

1. The two emergency doors described in figure 9 have been enlarged up to 6 inches in diameter in several installations.
2. Filler spouts have also been located just behind the wing. This offers greater safety during loading operations.
3. Tank gauges have been installed to indicate load levels. This eliminates tank over-loadings and sloppy loading areas.
4. Tanks having exterior flanges and a minimum of lips, pockets, and corners would give cleaner drops.

U. S. Department of Agriculture
Forest Service

CONSTRUCTION PLAN

for

TANK INSTALLATION IN TBM AIRCRAFT

This plan covers the tank and equipment described in this report. Other equally satisfactory tank designs have been used for this aircraft.

Materials. Standard aluminum sheet of 5052 and 2024 alloys are used for tank body and doors as shown on the drawings. All aluminum riveted seams, as well as rivet holes, are coated with an aluminum mastic sealing compound prior to riveting.

Steel support frame and plane anchor rails are fabricated from Cor-Ten or 4130 steel as shown on drawings. All bolts and nuts used are of aircraft quality heat treated alloy steel and cadmium plated or of equivalent corrosion resistant materials or treatment.

Tank stiffeners are 6063-T5 extruded aluminum angle.

Door Actuating Mechanism. Release and closure latches are of the quick release clamp type. Operation is by mechanical linkage on the latches actuated by hydraulic cylinders mounted on the front of the tank. Automatic door closing latches and cylinders are mounted as shown and connected in parallel with release cylinders. Hydraulic circuit is reversible so that doors can be closed in flight and the cylinders returned to the start of the operating cycle. Cylinders having similar sizes and capacity can be substituted for those shown, as long as door mechanism functions smoothly and is substantially identical to drawing details.

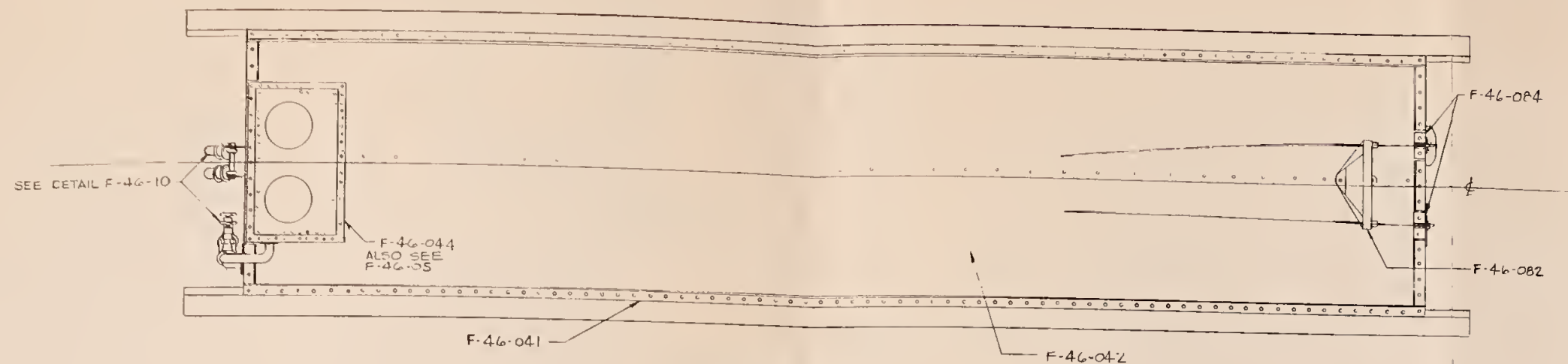
Door Hinges and Seal. Door hinges are of the offset type so as to eliminate a sliding closing action on the gasket. Shims should be used as necessary under the hinges to assure proper sealing of the doors. Seals can be either the cellular rubber type as shown, or molded hollow circular cross section type with a fastening lip, and vulcanized into an endless loop to provide a compression seal.

Controls. A manually operated 4-way hydraulic valve with two actuating handles, one for each door, is located adjacent to the throttle in the left side of the cockpit. The valve has a center closed position and is 2-way in operation so as to reverse the cycle. A safety latch is provided to prevent accidental movement of the handles to the open position. Indicator lights, normally off when doors are closed, are mounted on the valve mounting bracket so as to be readily visible to the pilot. Electrically operated valves are provided in parallel with the manual valve to permit control stick button operation of either or both

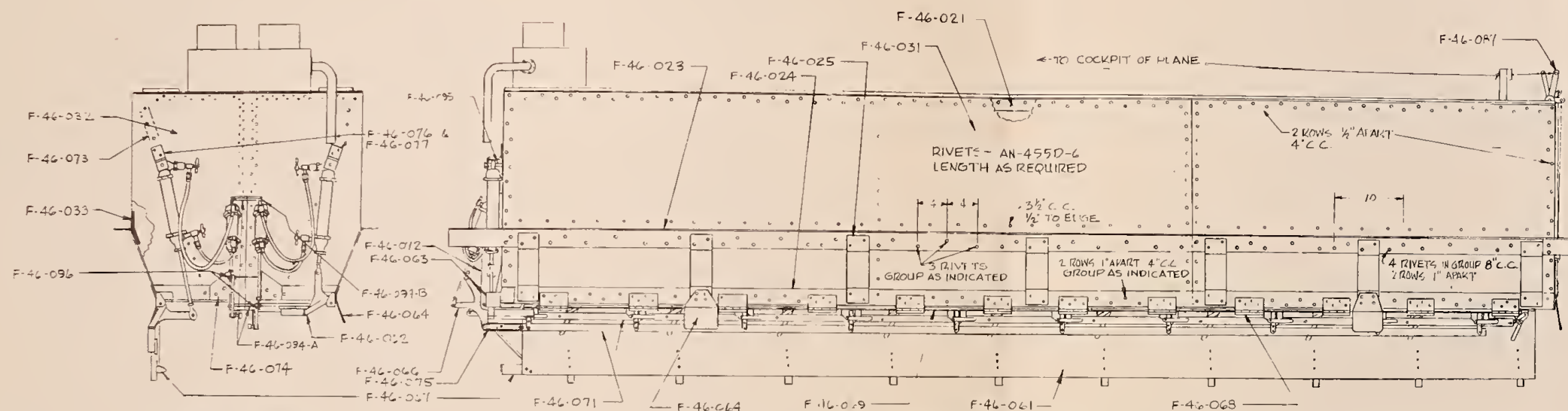
doors on the opening cycle. Reversal of the flow need not be electric for closing the doors. Suitable toggle type switches are provided for selecting one or both doors when using the electric release. A master switch is also provided for de-energizing the electric hydraulic valve circuit when not in use. The manual emergency drop door handles are located on the left side of the cockpit.

Fill Tubes. Fill tubes are provided on both sides of the aircraft. An overflow tube is provided to indicate when tank is full. A float valve seal for the fill opening is provided to prevent discharge during flight maneuvers.

Miscellaneous. All materials used in the construction, with the exception of serviceable hydraulic cylinders and valves, should be new, unused, and not reprocessed or reworked. Front end of tank should be provided with cowls which can be opened with quick release fasteners for inspection of front of tank, yet will fair front bottom of airplane as smoothly as possible. Although it has not been necessary to finish or paint aluminum materials, steel members are thoroughly cleaned and painted with a minimum of one coat of zinc chromate paint.

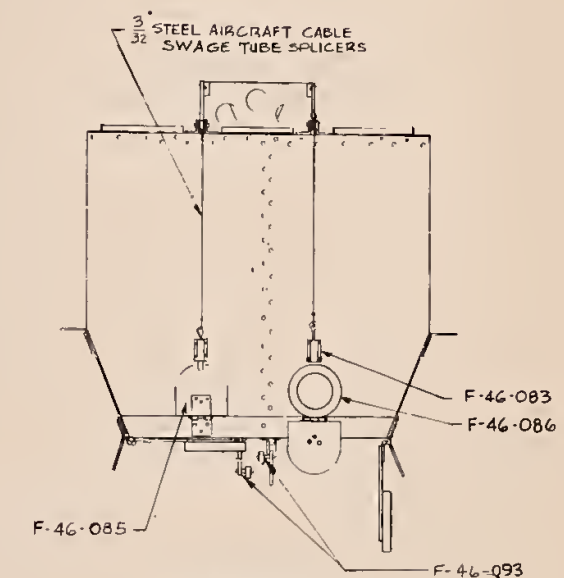


PLAN VIEW



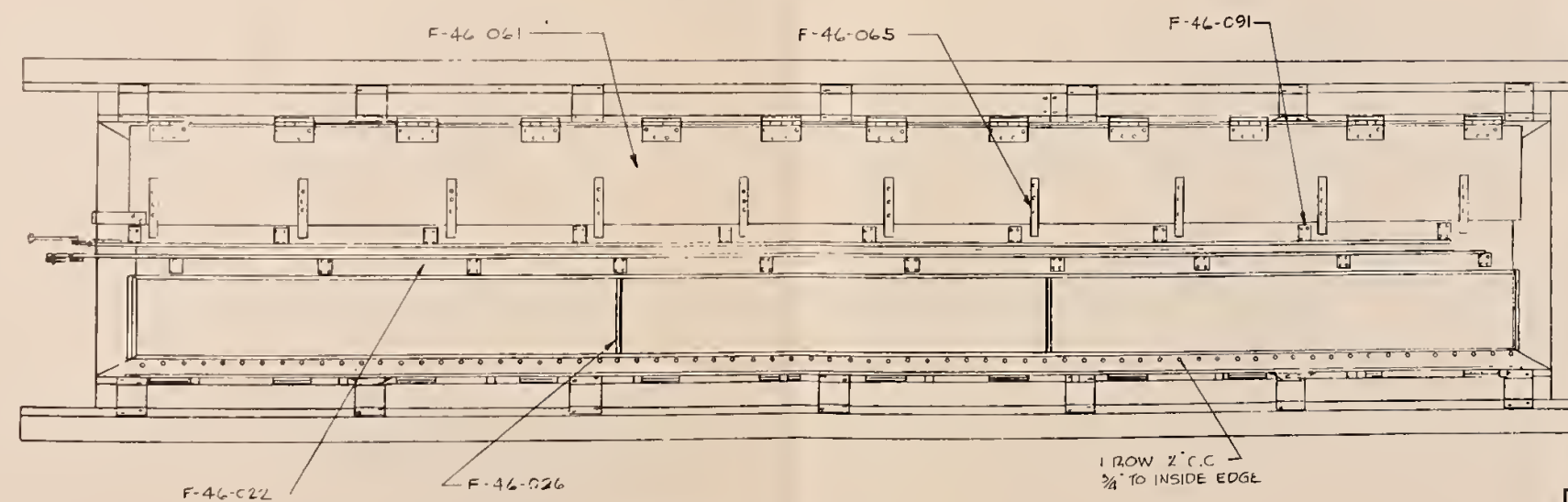
FRONT VIEW

SIDE VIEW



REAR VIEW

NOTE: — WHERE DIMENSIONS EXCEED
NORMAL SHEET SIZES - BUTT JOINTS WITH
SUITABLE RIVETING IS PERMITTED.



BOTTOM VIEW

TOLERANCES AND FINISHES

A = ±.010

A₁ = +.000

A₂ = -.010

A₃ = +.010

D = NOT OVER NOR UNDER 1/16"

D₁ = NOT OVER NOR MORE THAN 1/16" UNDER

D₂ = NOT UNDER NOR MORE THAN 1/16" OVER

ALSO B = 1/64" C = 1/32"

MAX. TOLERANCE ON FINISHED DIMENSIONS
OF D UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS AND SHARP CORNERS

FINISH BY POLISHING

FINISH WITH FILE

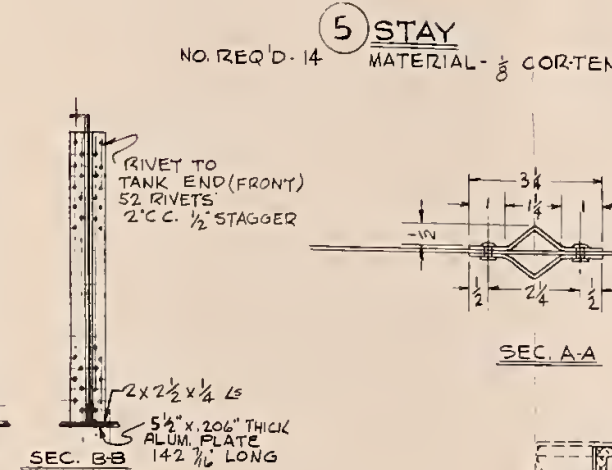
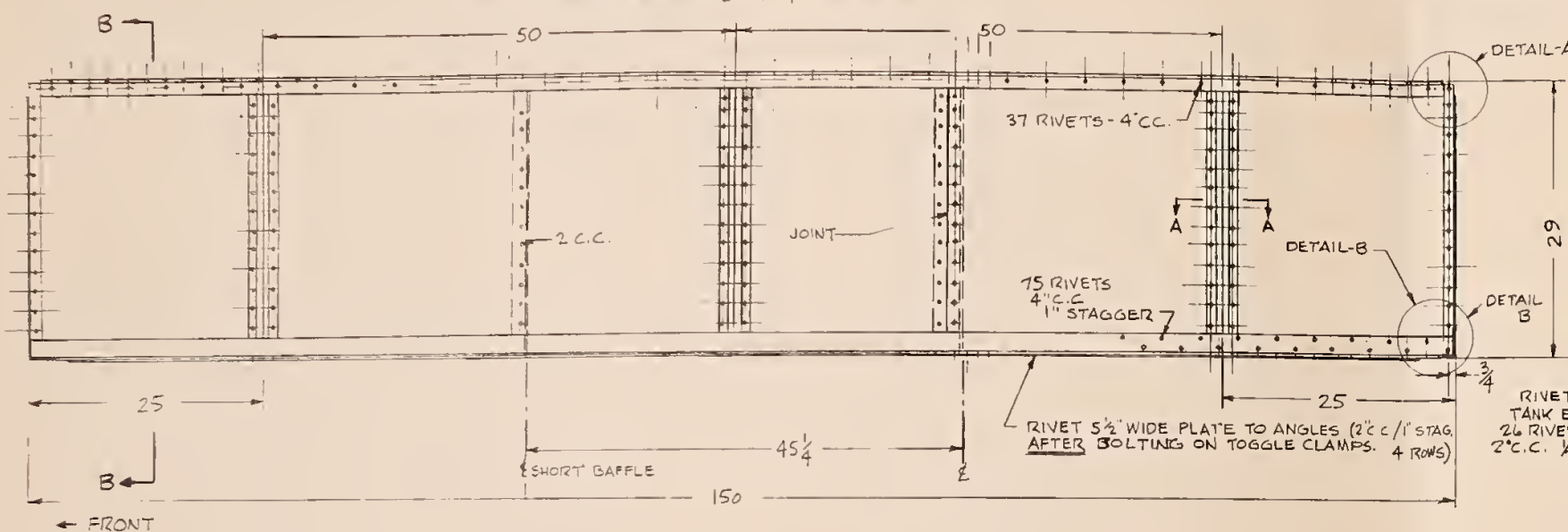
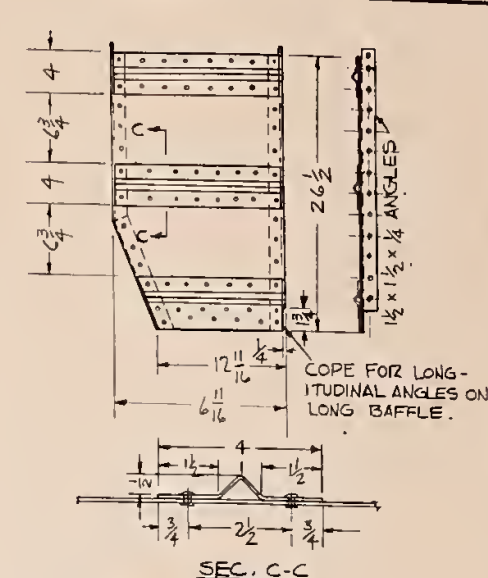
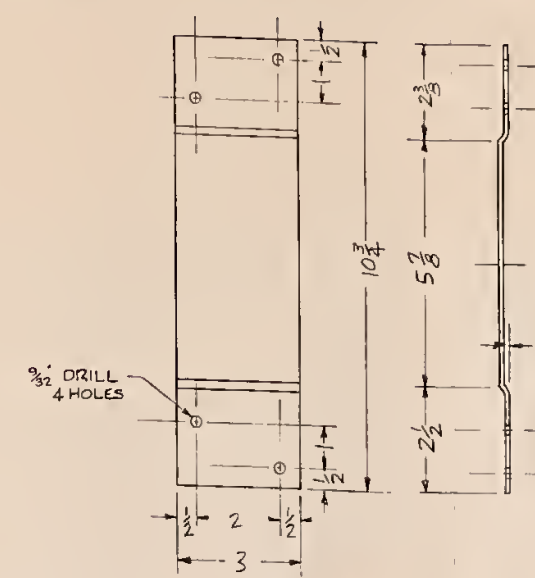
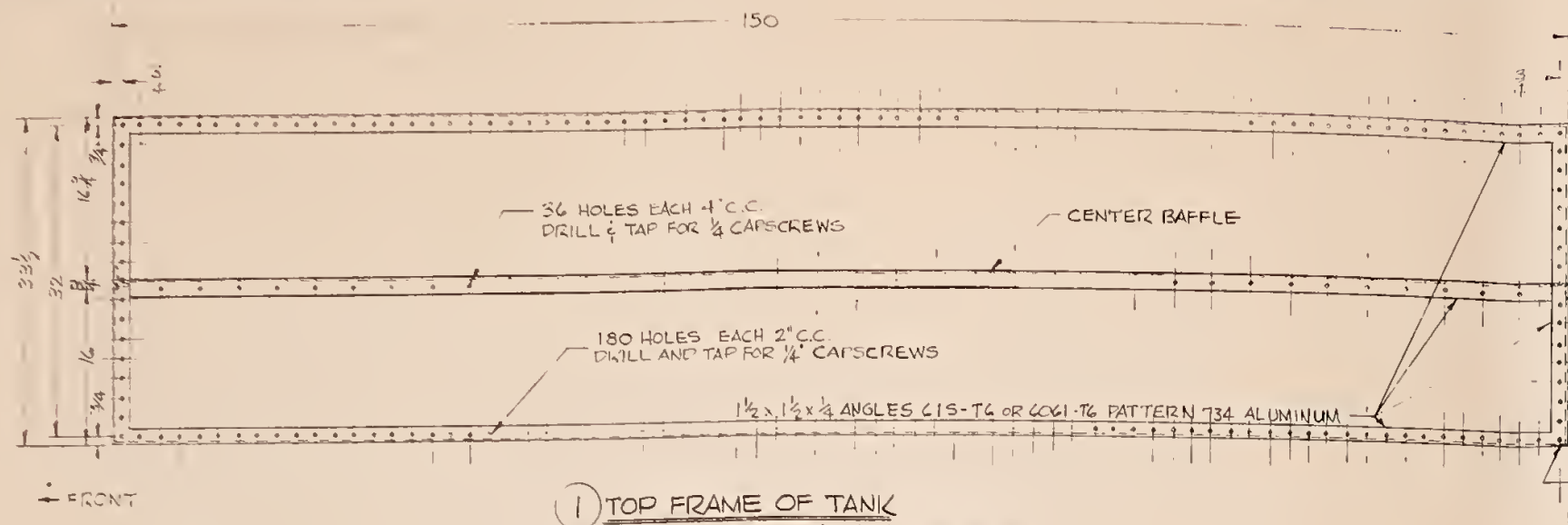
FINISH BY GRINDING

FINISH BY ROUGH TOOL

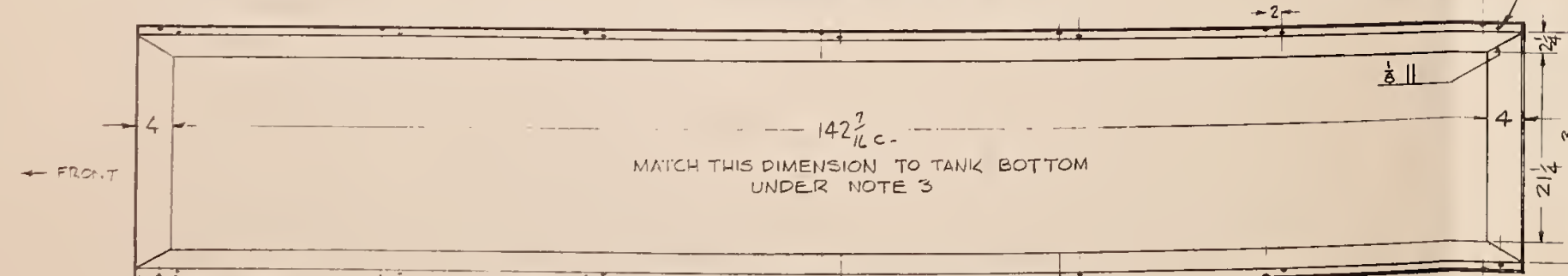
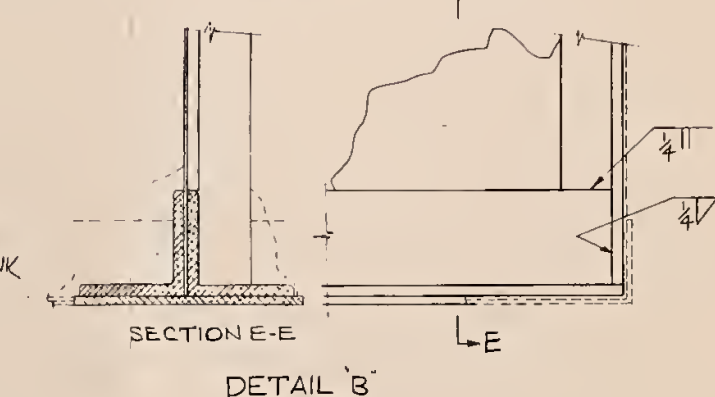
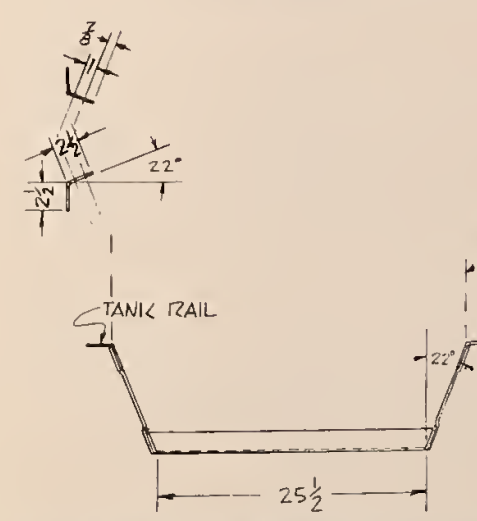
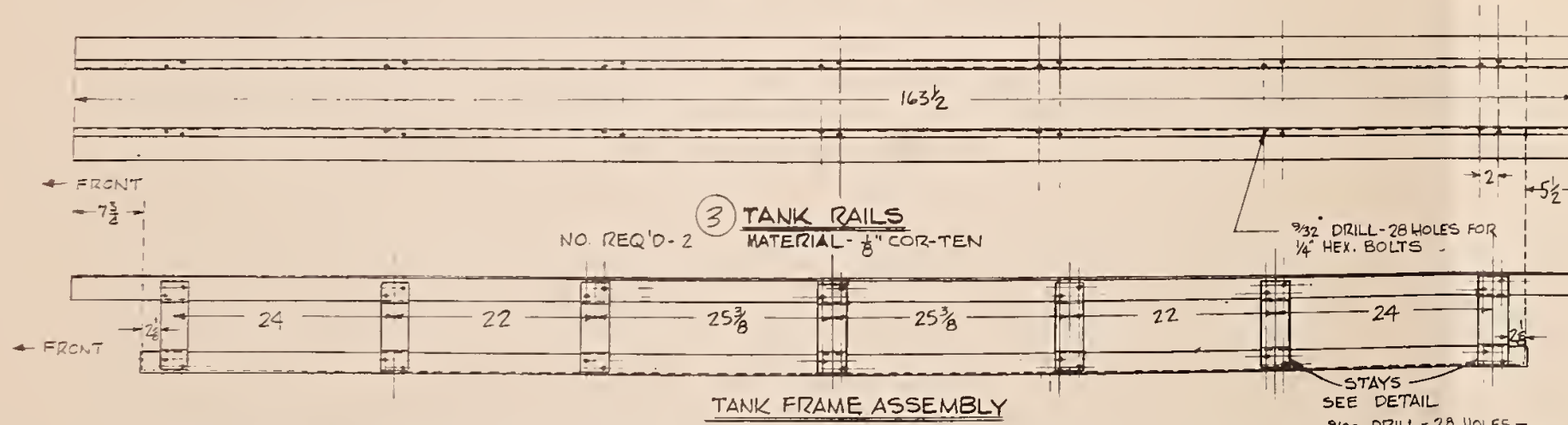
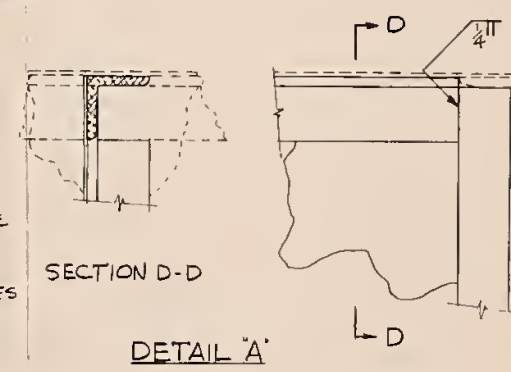
NOTE: MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
PREVIOUS OK FROM THE DESIGNING ENGINEER

SYMBOL	DATE	DESCRIPTION OF REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			
ARCADIA EQUIPMENT DEVELOPMENT CENTER			
TANK FOR TBM AIR TANKER GENERAL ASSEMBLY			
DRAWN: J.S.C.		CHECKED: J.G.	DRAWING NUMBER F-46-01
APPROVED:		DATE: 10-31-57	SHEET: 1 OF 1
SCALE: 1/8" = 1"			





NOTE: WHERE DIMENSIONS EXCEED AVAILABLE
NORMAL SHEET SIZES - BUTT JOINTS
WITH SUITABLE RIVETING IS PER-
MITTED. INCREASE 1 1/2" x 1 1/2" x 1/4" ANGLES
TO 3" x 1 1/2" x 1/4" ANGLES ON SHORT
BAFFLES FOR JOINT.

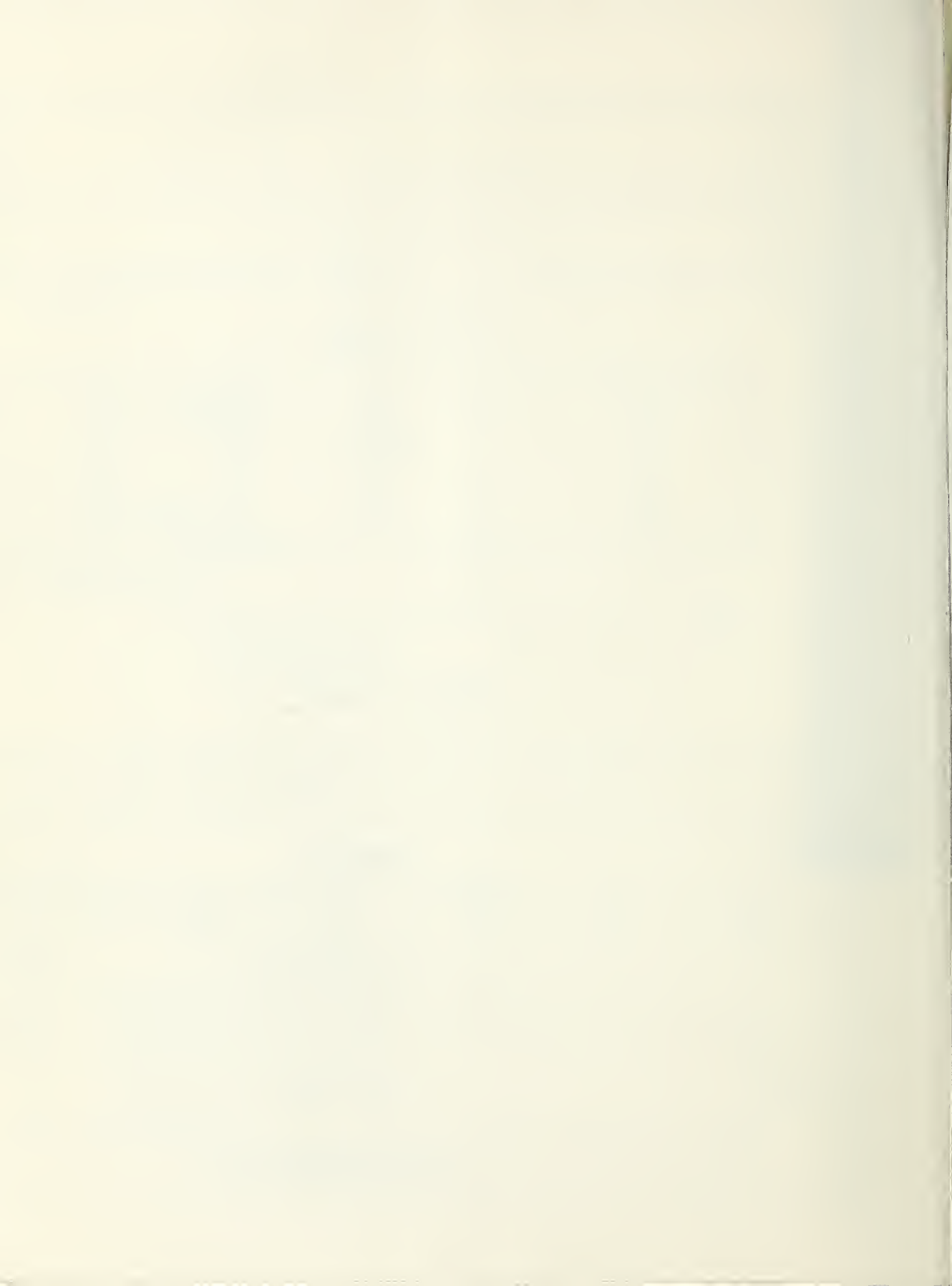


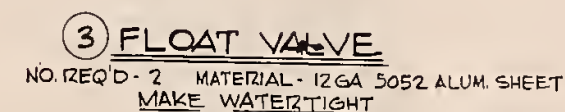
- SUGGESTED TANK FABRICATION PROCEDURE:
1. PAINT ON GASKET MATERIAL (ALUMILASTIC C GRADE) WHEN MEMBERS ARE RIVETED OR BOLTED TOGETHER.
 2. ASSEMBLE TANK FROM PARTS F-46-031 AND F-46-032 (SIDES & ENDS).
 3. RIVET PART-024 IN POSITION ON BOTTOM OF TANK SHELL.
 4. SET STAYS TO LOCATION AND BOLT AT BOTTOM.
 5. SET TANK RAILS, PART-023, IN POSITION BETWEEN TANK AND STAYS.
 6. PLACE INSIDE RAILS, F-46-033, TO MATCH BREAK ON TANK SURFACE BEHIND PART-023, RIVET THROUGH 3 THICKNESSES.
 7. BOLT STAYS AT TOP.
 8. INSERT CENTER BAFFLE, PART-022 WITH PART-026 ATTACHED.
 9. INSTALL TOP FRAME, PART-021.

NOTE: MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
PREVIOUS OK FROM THE DESIGNING ENGINEER

TOLERANCES AND FINISHES	
A = ±.010	/F = FINISH BY POLISHING
A+ = +.000	/F = FINISH WITH FILE
- .010	/F = FINISH BY GRINDING
A+ = +.010	/R = FINISH BY ROUGH TOOL
- .000	
O = NOT OVER NOR UNDER 1/16"	
D = NOT OVER NOR MORE THAN 1/16" UNDER	
O+ = NOT UNDER NOR MORE THAN 1/16" OVER	
ALSO B = 1/64" C = 1/32"	
MAX TOLERANCE ON FINISHED DIMENSIONS OF D UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS AND SHARP CORNERS	

SYMBOL	DATE	DESCRIPTION OF REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			
ARCADIA EQUIPMENT DEVELOPMENT CENTER			
TANK FOR TBM AIR TANKER			
TANK CONSTRUCTION DETAILS			
DRAWN	JSC	CHECKED	JTG
APPROVED			
SCALE	3/4" = 1'	DATE	10-23-57
DRAWING NUMBER			F-46-02
SHEET			2 OF 10





SYMBOL	DATE	DESCRIPTION OF REVISION	B
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			

ARCADIA EQUIPMENT DEVELOPMENT CENTER

TANK FOR TBM
AIR TANKER
TANK TOP DETAILS

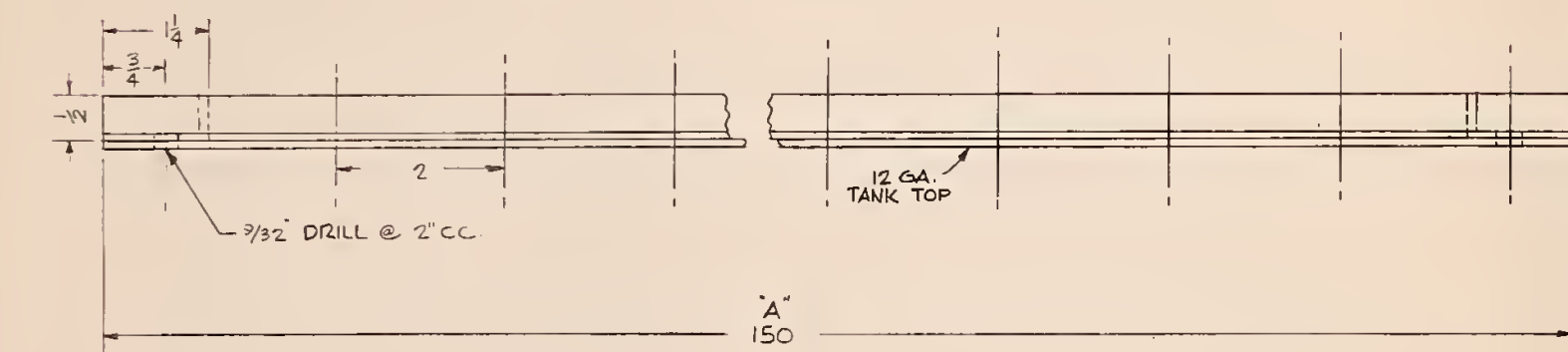
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TOLERANCES AND FINISHES

$A \pm .010$	\approx FINISH BY POLISHING
$A_{-} + .000$	\approx FINISH WITH FILE
$- .010$	\approx FINISH BY GRINDING
$A_{+} - .010$	\approx FINISH BY RROUGH TOOL
$- .000$	
$D =$	NOT OVER NOR UNDER $1/16"$
D_{-}	NOT OVER NOR MORE THAN $1/16"$ UNDER
D_{+}	NOT UNDER NOR MORE THAN $1/16"$ OVER
also	$B = 1/64"$ $C = 1/32"$

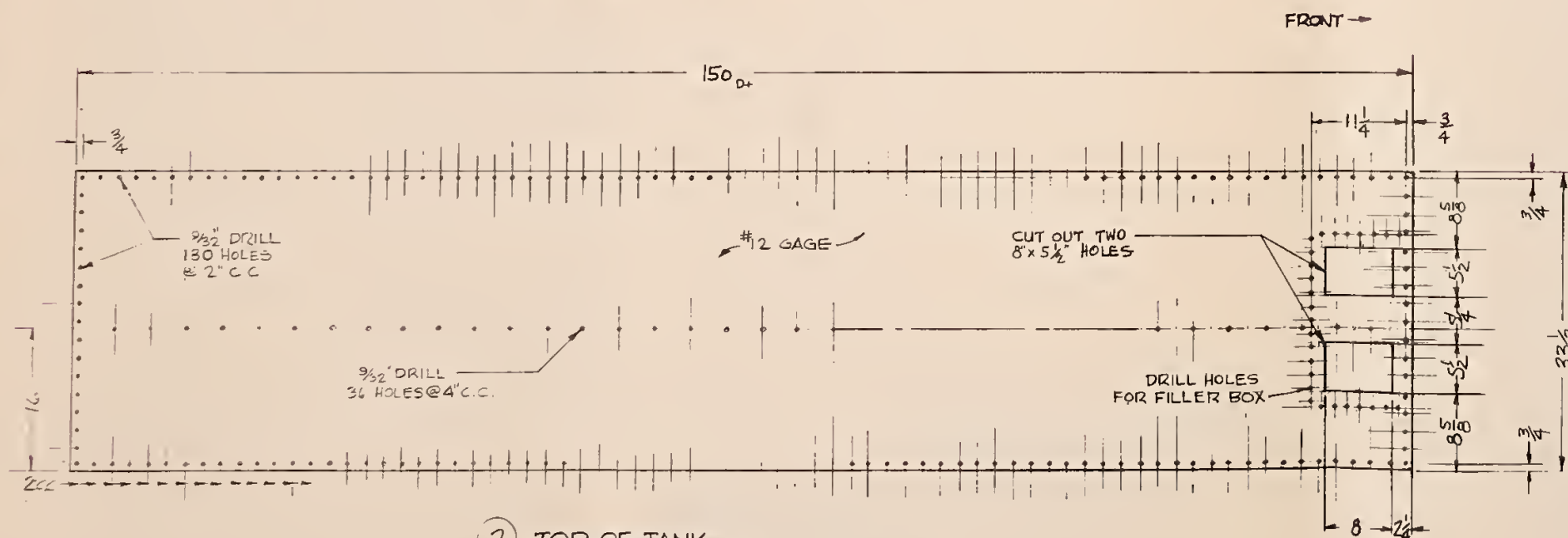
MAX. TOLERANCE ON FINISHED DIMENSIONS
OF UNLESS OTHERWISE SPECIFIED
REMOVE ALL RUFFS AND SHARP CORNERS

NOTE MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
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① DETAIL OF STIFFENER

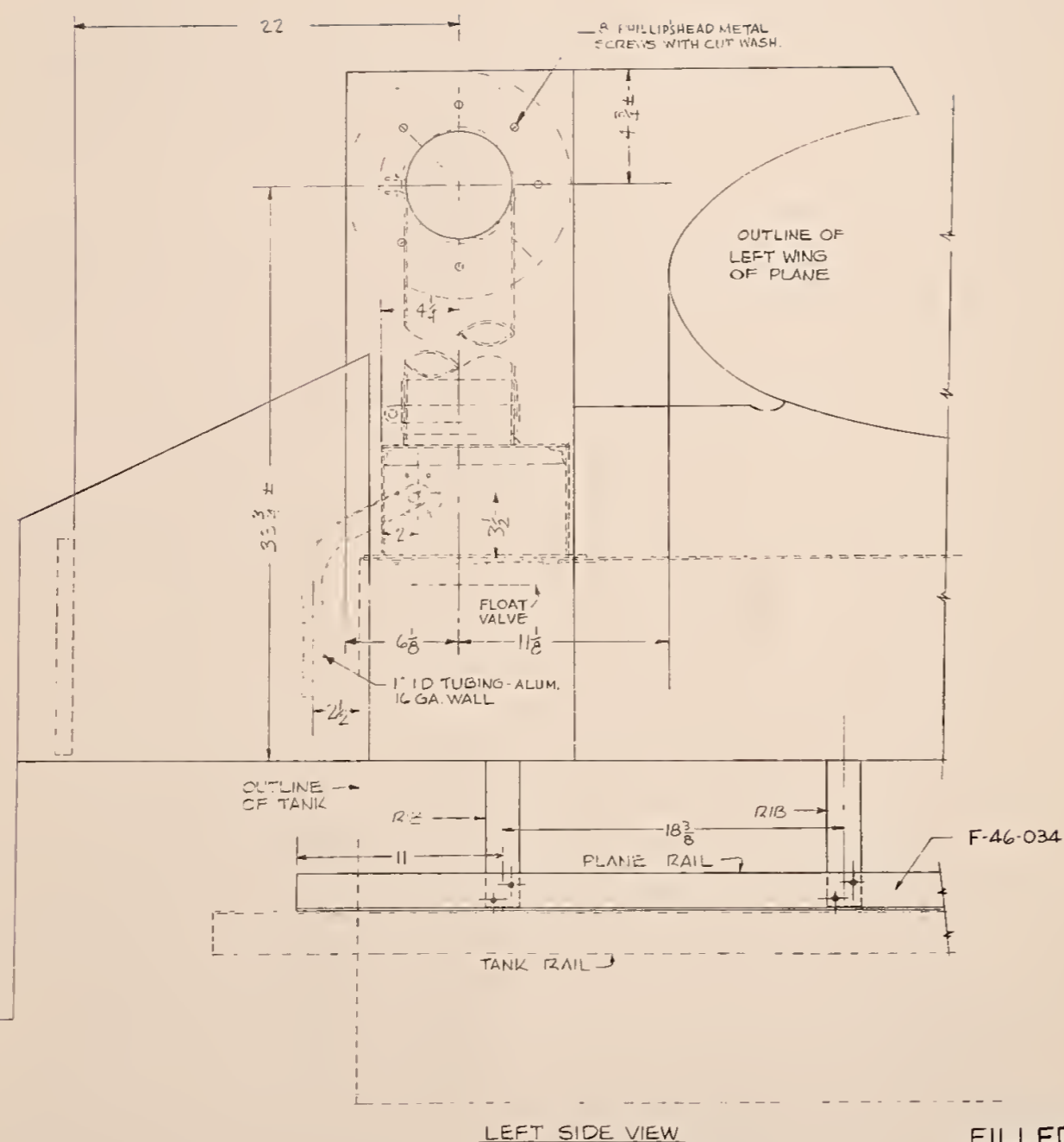
2 REQ'D - $\Delta = 150'$ 2 REQ'D - $\Delta = 8\frac{3}{4}"$ MATERIAL - EXTRUDED 6063-T5 $1\frac{1}{2} \times \frac{1}{2} \times \frac{1}{8}$ ANGLE
1 REQ'D - $\Delta = 6\frac{3}{4}"$ 2 REQ'D - $\Delta = 5\frac{3}{8}"$



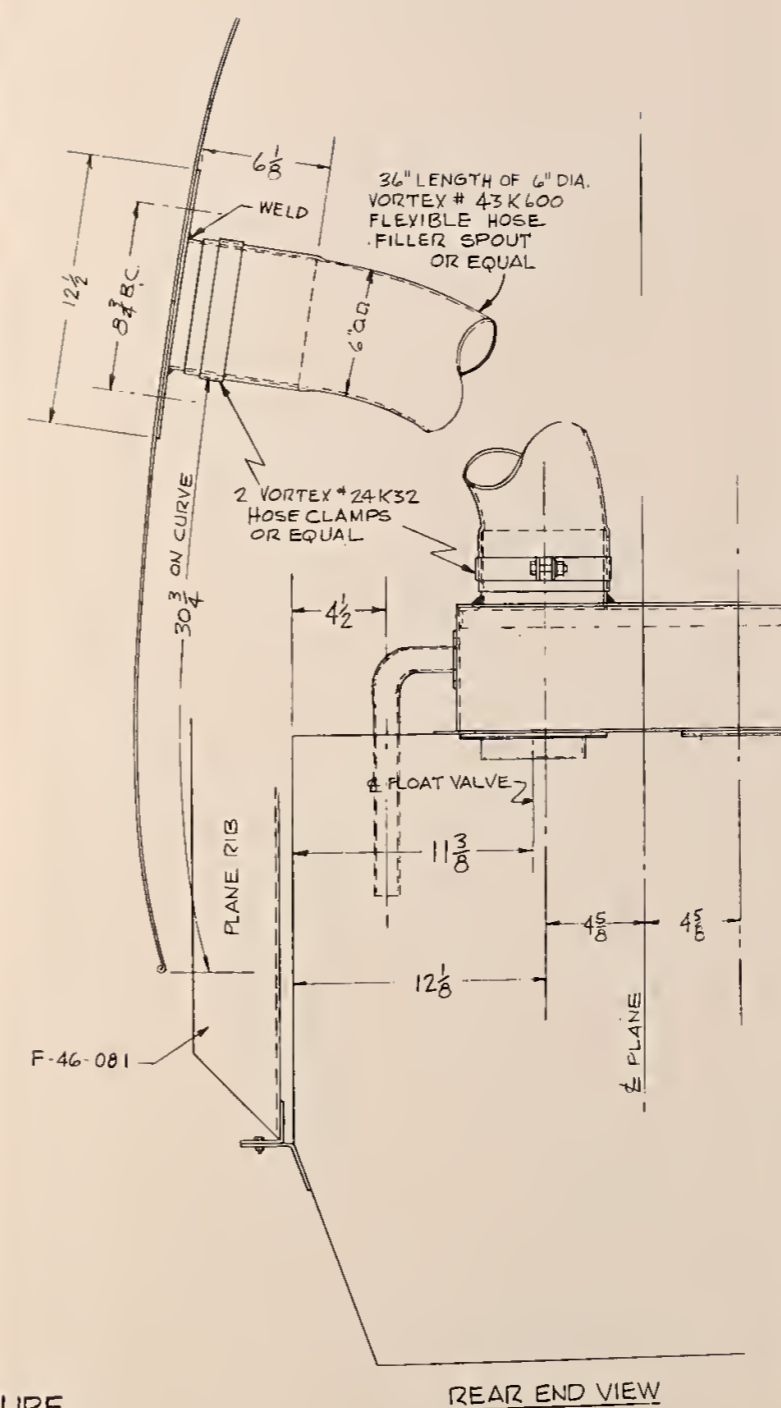
② TOP OF TANK

NO REQ'D - ONE MATERIAL - 12 GA #5052 ALUM. ALLOY SHEET





FILLER OPENING & TUBE
NUMBER REQUIRED - TWO



TOLERANCES AND FINISHES

A = ± .010 *sf* = FINISH BY POLISHING
 A = + .000 *sf* = FINISH WITH FILE
 A = - .010 *sf* = FINISH BY GRINDING
 A = + .010 *sf* = FINISH BY ROUGH TOOL
 A = - .000

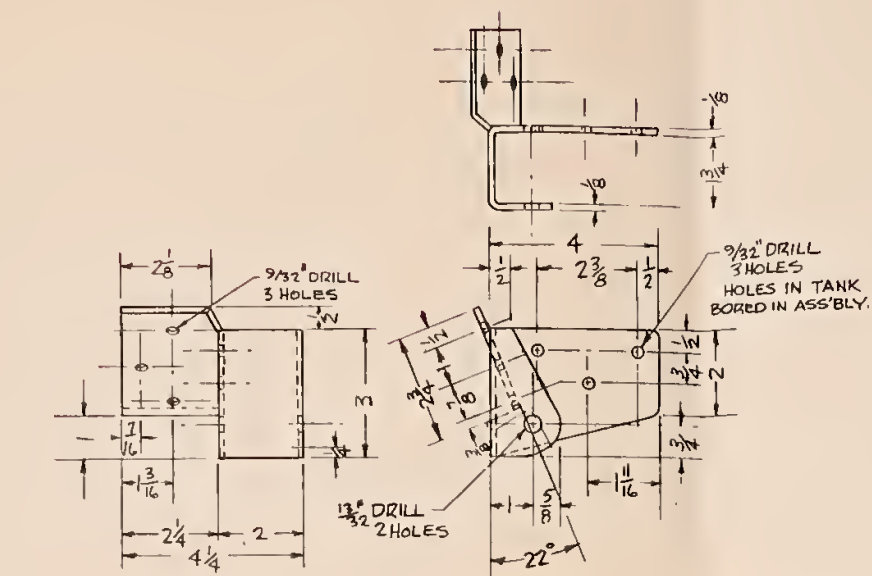
D = NOT OVER NOR UNDER 1/16"
 O = NOT OVER NOR MORE THAN 1/16" UNDER
 O = NOT UNDER NOR MORE THAN 1/16" OVER

ALSO B = 1/64" C = 1/32"

MAX. TOLERANCE ON FINISHED DIMENSIONS
 OF D UNLESS OTHERWISE SPECIFIED
 REMOVE ALL BURRS AND SHARP CORNERS

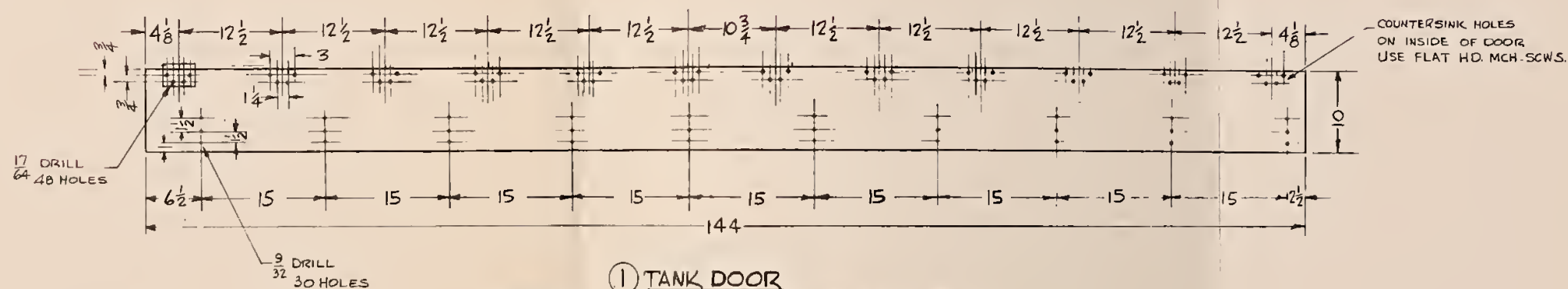
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SYMBOL	DATE	DESCRIPTION OF REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			
ARCADIA EQUIPMENT DEVELOPMENT CENTER			
TANK FOR TBM AIR TANKER FILLER OPENING & TUBE			
DRAWN <i>JS</i> CHECKED <i>TS</i>		DRAWING NUMBER F-46-05	
APPROVED <i>JS</i>		DATE <i>12-11-57</i>	
SCALE <i>1/4"</i>		SHEET <i>5</i> OF <i>10</i>	

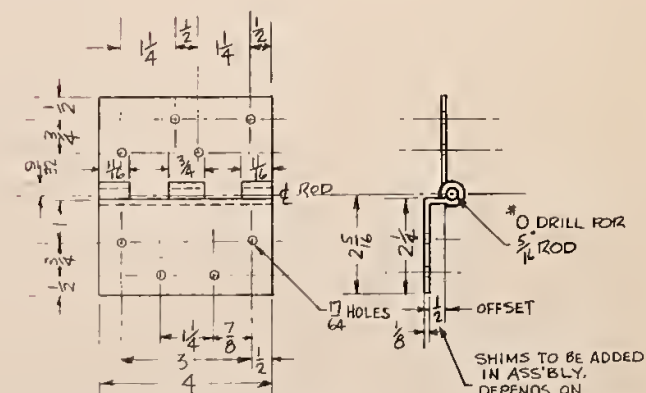


④ DOOR STOPS
NO. REQ'D - 4 MATERIAL - $\frac{1}{8}$ STEEL PLATE

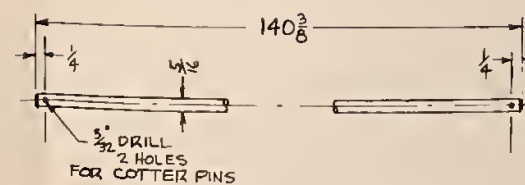
NO REQ'D-20 MATERIAL- $\frac{7}{16} \times \frac{7}{8} \times \frac{1}{8}$ STEEL CHANNEL
OR $\frac{7}{8} \times 11$ GA. SQUARE STEEL TUBING



① TANK DOOR
NO. REQ'D-2 MATERIAL- $\frac{3}{8}$ " ALUM. PLATE *2024-T4-00-A-355
ALCOA .375" - AND.



⑨ HINGE PINS FOR DOORS
NO. REQ'D - 2 MATERIAL - $\frac{5}{16}$ STEEL ROD
A.M.S. - 5610E TYPE 416 STAINLESS



NOTE :- HOLES IN TANK, FOR FITTINGS TO TANK, BORED IF REQUIRED IN ASSEMBLY

⑦ MICRO SWITCH ACTUATOR ARM
NO. REQ'D - 2 (RIGHT (SHOWN) - 1 LEFT) MATERIAL - $\frac{1}{2}$ STEEL PLATE

NO REQ'D-22 MATERIAL - $\frac{1}{8}$ WROUGHT STEEL
HALF SURFACE BUTT HINGES.
STANLEY #125 REVERSIBLE

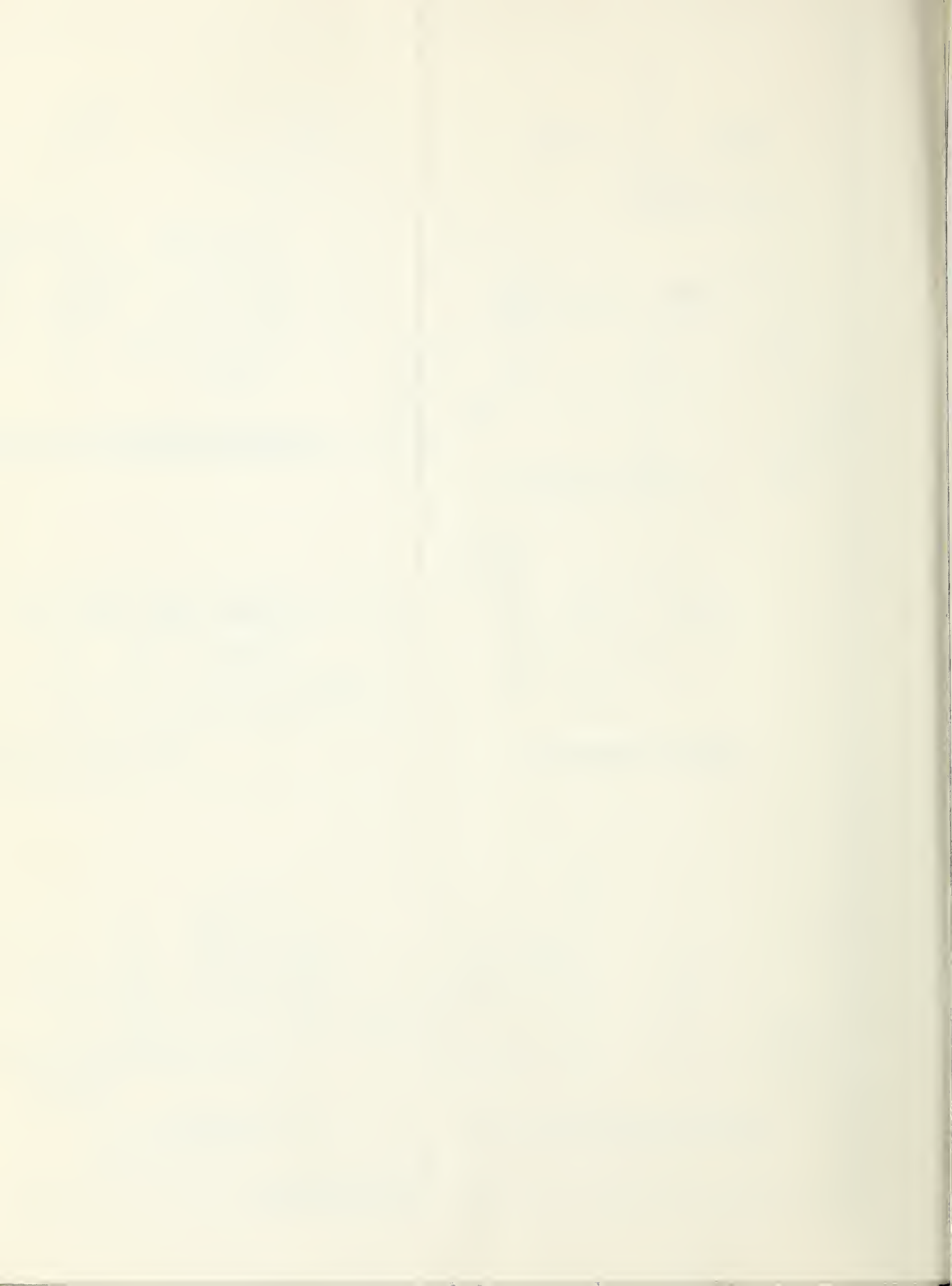
TOLERANCES AND FINISHES

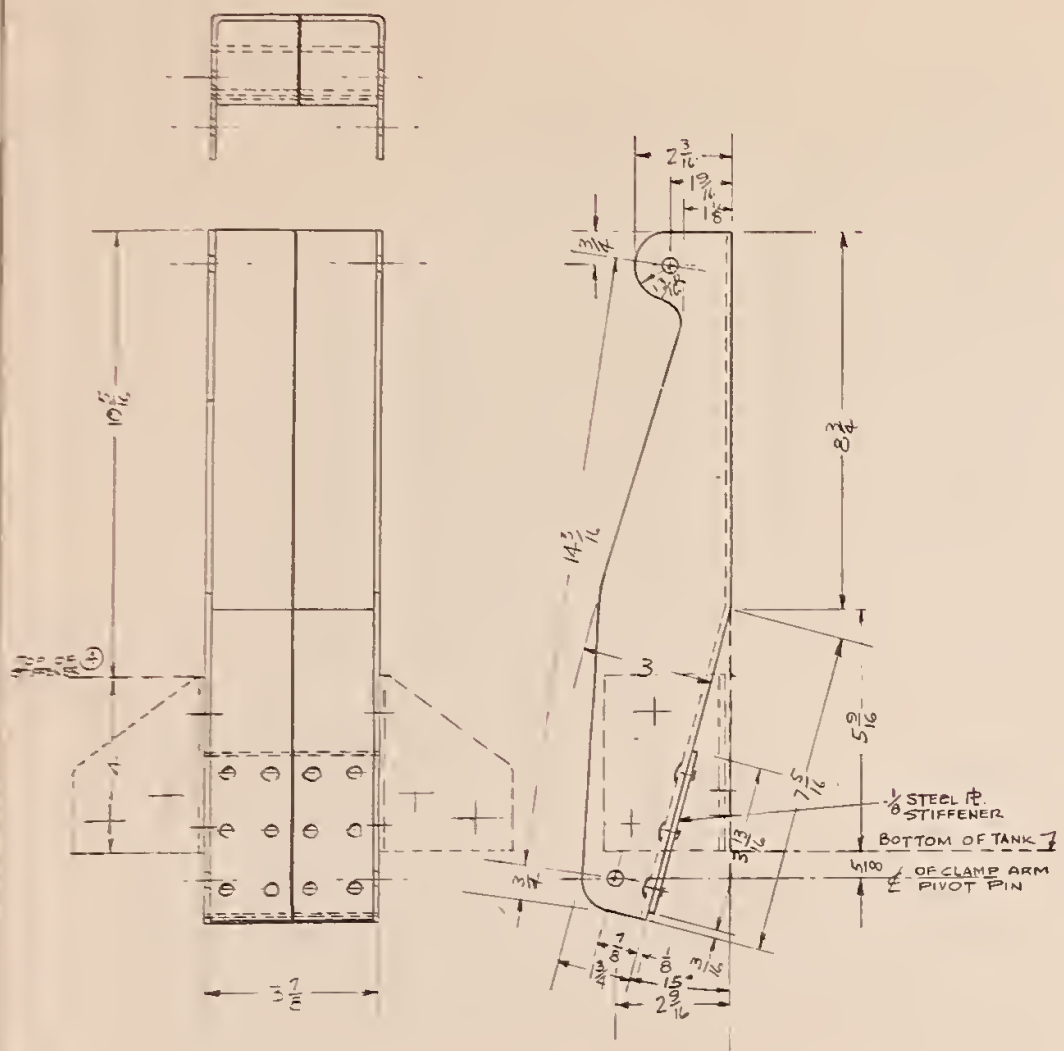
A = $\pm .010$	f = FINISH BY POLISHING
A ₊ = $+ .000$	f = FINISH WITH FILE
$-.010$	f = FINISH BY GRINDING
A ₊ = $\pm .010$	f = FINISH BY ROUGH TOOL
$-.000$	
O = NOT OVER NOR UNDER 1/16"	
D ₊ = NOT OVER NOR MORE THAN 1/16" UNDER	
D ₋ = NOT UNDER NOR MORE THAN 1/16" OVER	
MAX. B = 1/64" C = 1/32"	

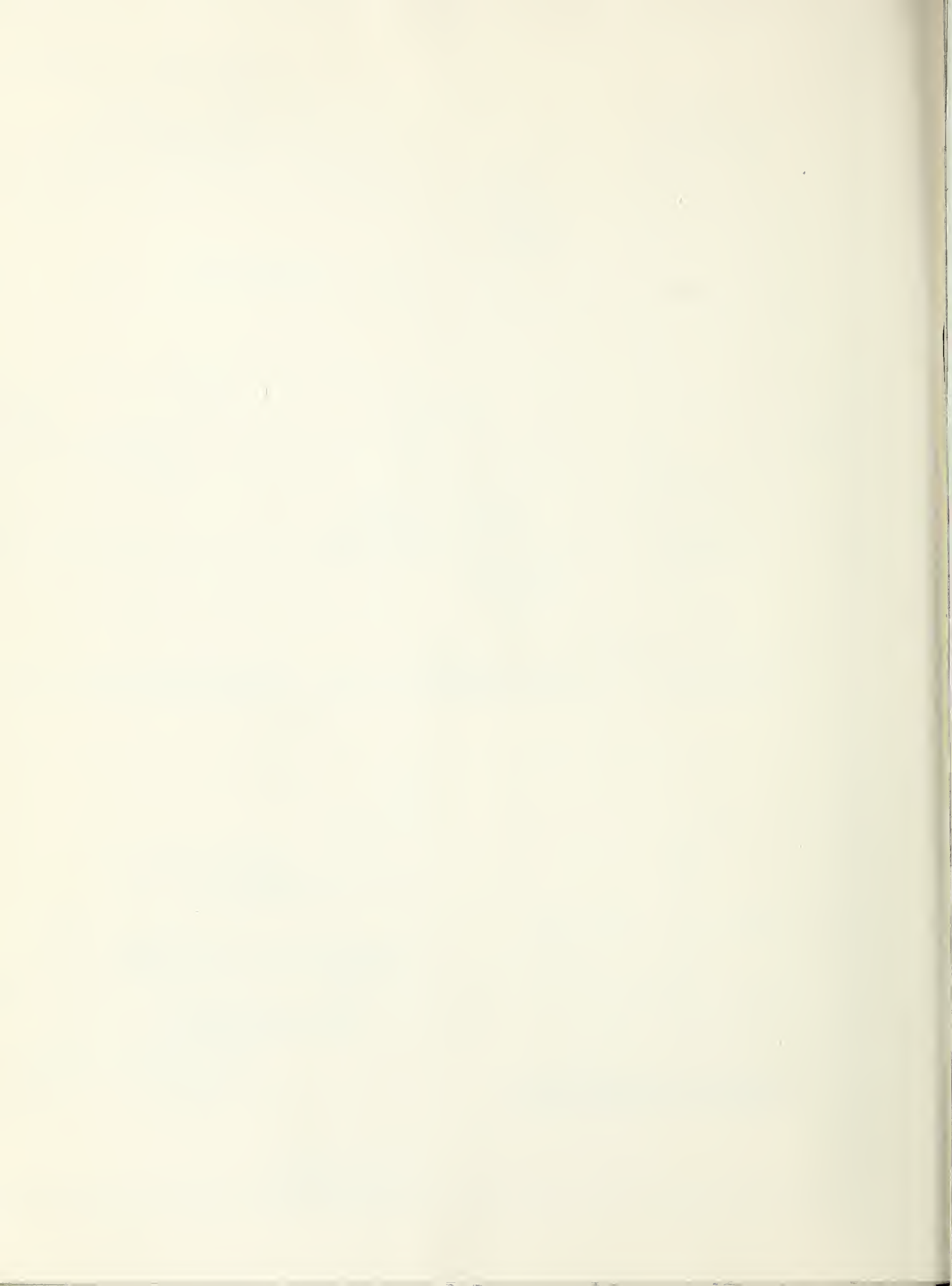
also TOLERANCE ON FINISHED DIMENSIONS
OF D UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS AND SHARP CORNERS

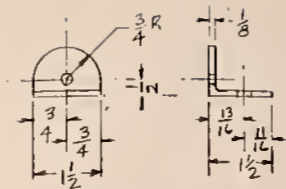
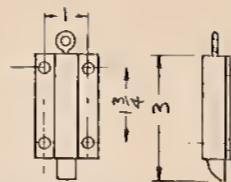
SYMBOL	DATE	DESCRIPTION OF REVISION		BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE				
ARCADIA EQUIPMENT DEVELOPMENT CENTER				
<p>TANK FOR TBM AIR TANKER DOOR DETAILS</p>				
DRAWN <i>W.S.C.</i>		CHECKED <i>T.G.</i>		DRAWING NUMBER
APPROVED				F-46-06
SCALE <i>1/4" = 1'-0"</i>		DATE <i>9-24-57</i>		SHEET <i>62</i> OF <i>10</i>

NOTE MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
PREVIOUS OK FROM THE DESIGNING ENGINEER

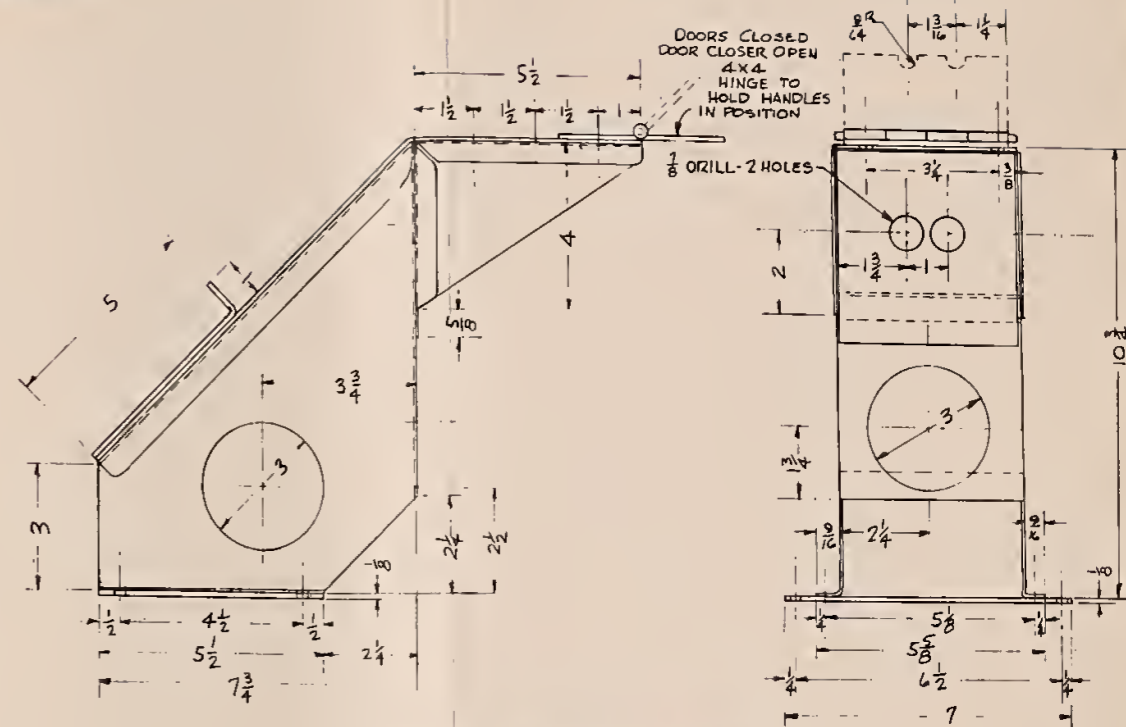
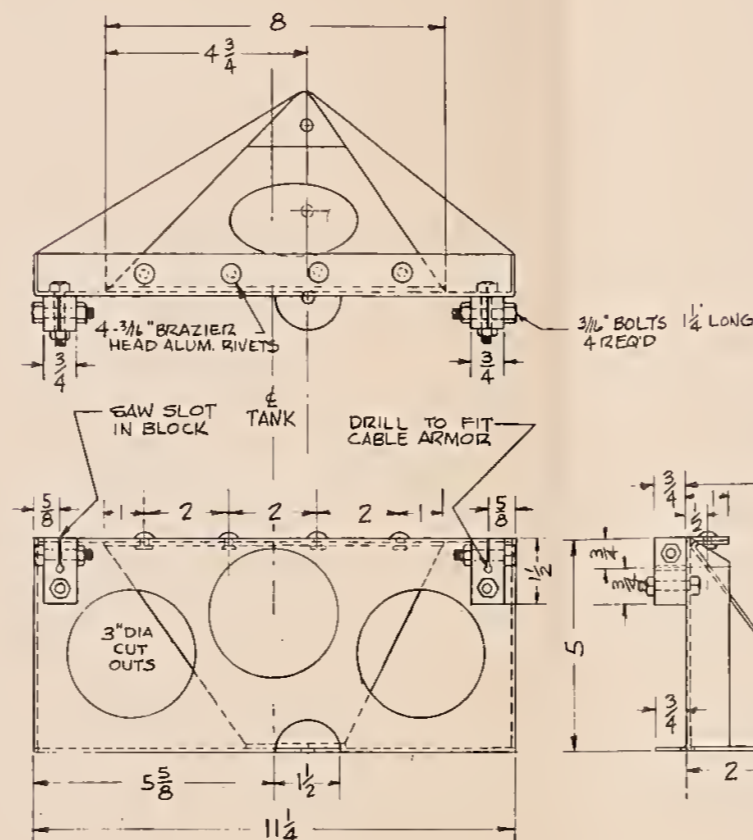






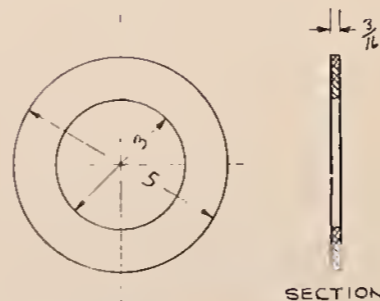


④ CRANK ARM HINGE ANGLE
NO. REQ'D - 4 MATERIAL - $\frac{1}{8}$ STEEL



⑧ VALVE CONTROL HOLDER
NO. REQ'D - ONE MATERIAL - 16 GA. ALUMINUM
MOUNTING SUBJECT TO VALVE USED

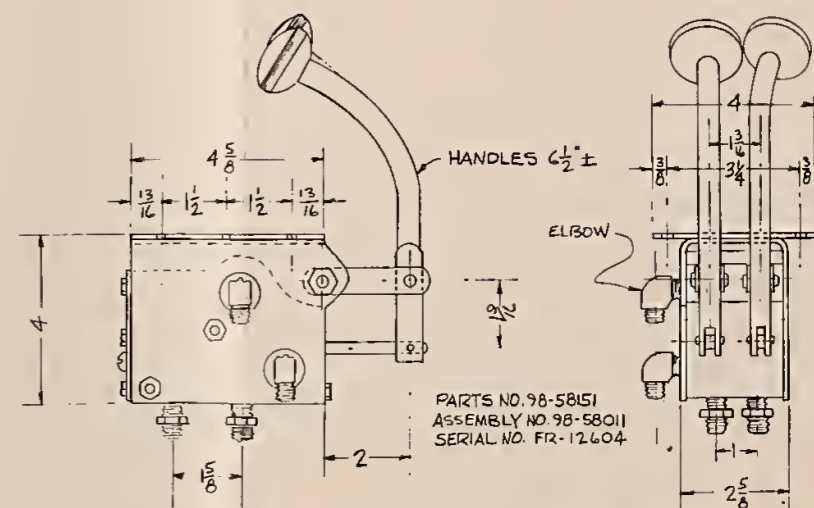
② ANCHOR & GUIDE BRACKET FOR SAFETY PULL
NO. REQ'D - ONE MATERIAL - 12 GA. 5052 ALUM. SHEET



Technical drawing of a mechanical part. The drawing includes the following dimensions and features:

- Top view: A trapezoidal shape with a top width of $1\frac{3}{4}$ and a bottom width of $2\frac{1}{2}$. The height is $1\frac{1}{4}$. A vertical centerline is shown. A dimension of $1\frac{3}{8}$ is indicated from the left edge to the centerline.
- Side view: A rectangular shape with a height of 4 and a width of $\frac{1}{4}$. The top and bottom edges are labeled "mild".
- Angle: A dimension of 13° is shown at the top left corner.
- Note: A note points to the bottom right corner of the top view, stating: $\frac{9}{32}$ DRILL 3 HOLES.

⑦ CRANK ARM
NO. REQ'D - 2 MATERIAL - $\frac{1}{4}$ " STEEL PLATE



9) VALVE CONTROL
NO. REQ'D - ONE
4 WAY-CLOSED CENTER

SYMBOL	DATE	DESCRIPTION OF REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			
ARCADIA EQUIPMENT DEVELOPMENT CENTER			
TANK FOR TBM AIR TANKER MISC. DETAILS			
DRAWN	JSC-WER CHECKED: T.C.		DRAWING NUMBER
APPROVED			F-46-08
APPROVED			SHEET: 8. OF 10.
SCALE: 3/4" = 1'	DATE: 10-31-57		

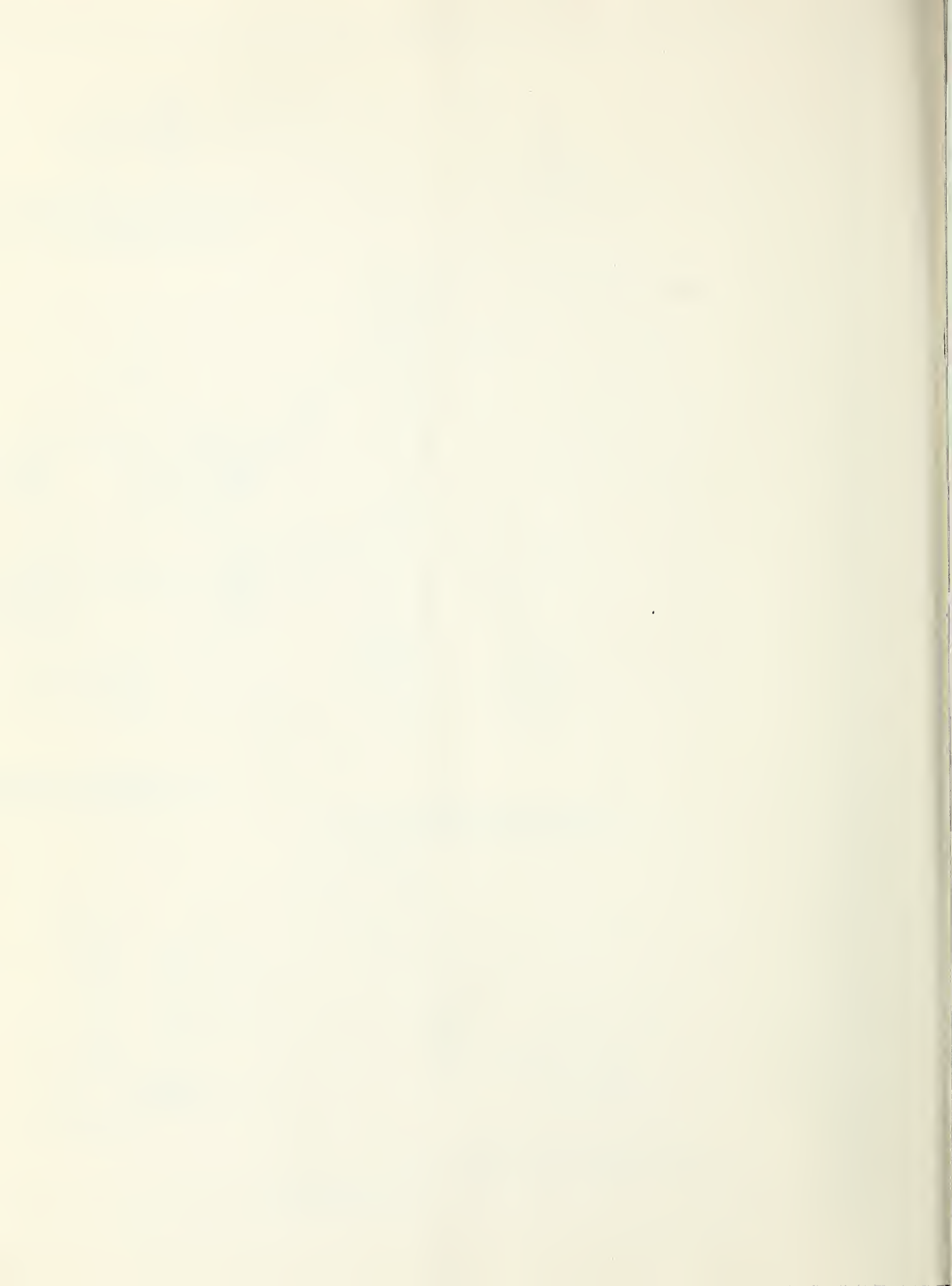
TOLERANCES AND FINISHES

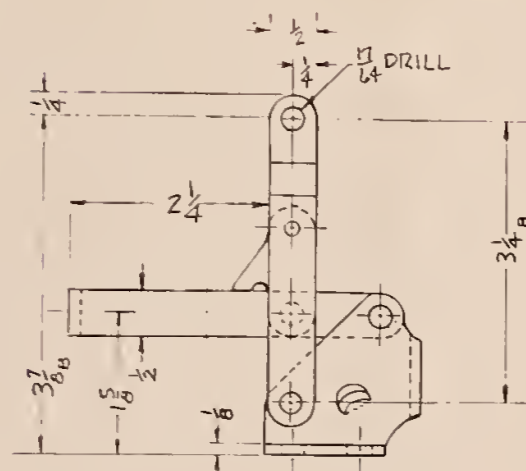
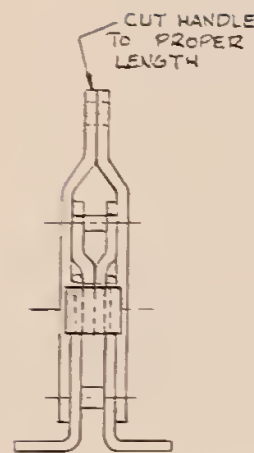
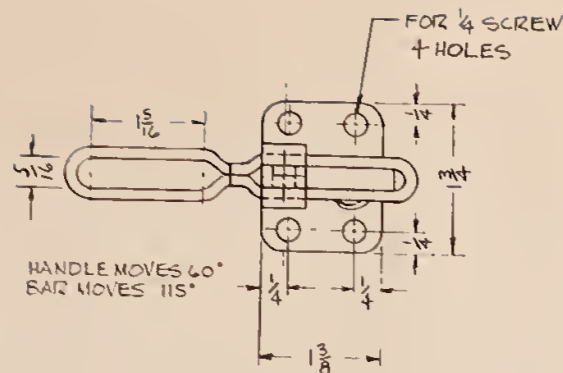
A = $\pm .010$	f = FINISH BY POLISHING
A ₁ = $+.000$ $-.010$	f ₁ = FINISH WITH FILE
A ₂ = $+.010$ $-.000$	f ₂ = FINISH BY GRINDING
	f ₃ = FINISH BY ROUGH TOOL

O = NOT OVER NOR UNDER $1/16"$
O₁ = NOT OVER NOR MORE THAN $1/16"$ UNDER
O₂ = NOT UNDER NOR MORE THAN $1/16"$ OVER
ALSO B = $1/64"$ C = $1/32"$

MAX. TOLERANCE ON FINISHED DIMENSIONS
OF $\pm .0005$ UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS AND SHARP CORNERS

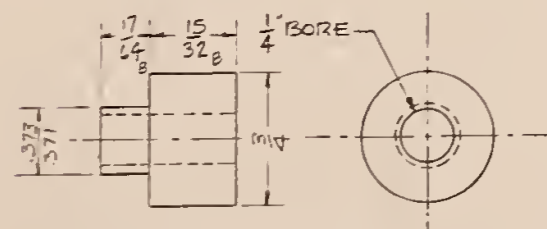
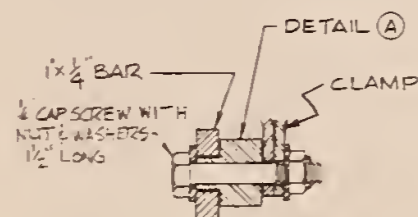
NOTE MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
PREVIOUS OK FROM THE DESIGNING ENGINEER





1 CLAMP

NO REQ'D - 20 "DE-STA-CO" MODEL 207-USS
DETROIT STAMPING CO. - 500 LBS. HOLDING PRESSURE

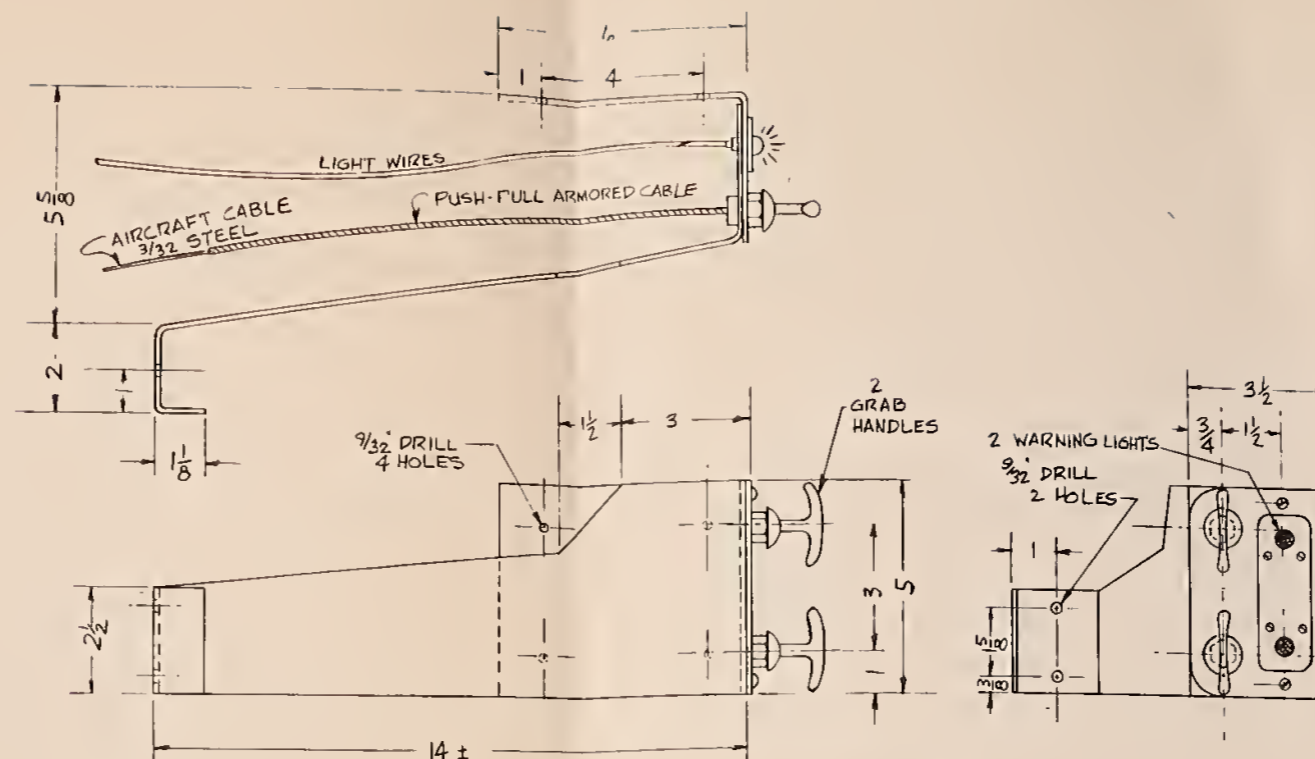


A SHOULDER BUSHING

3 SPACER

NO REQ'D - 20 MATERIAL - COLD DRAWN, STRESS PROOF
STEEL, 3/4" ROUND

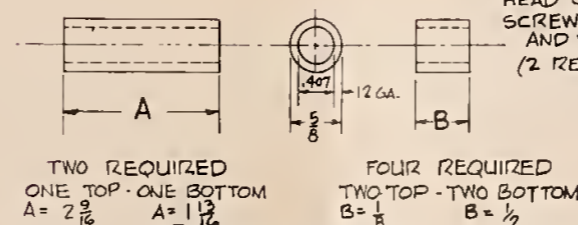
SCALE - DOUBLE



2 LIGHTS AND PULL KNOBS FOR REAR EMERGENCY DROP DOORS

NO REQ'D - ONE MATERIAL - 1/8" STEEL SHEET SCALE - 1/2

NOTE: THIS DRAWING MADE FROM
PHOTO. DIMENSIONS MAY VARY.



4 SPACERS

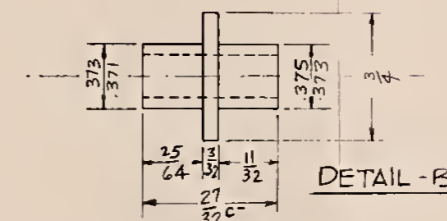
FOR GATE-LOCK CYLINDERS
5/8" O.D. COLD DRAWN MECH. TUBING
SCALE - FULL

NOTE - USE 3/8" HEX.
HEAD CAPSCREWS
WITH NUTS AND
WASHERS.
(2 REQ'D - 3 1/2" LONG)

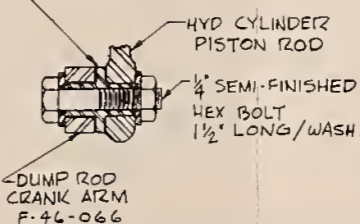
5 SPACER

FOR DOOR CLOSING CYLINDERS

NO REQ'D - 2 MATERIAL - 5/8" O.D. COLD DRAWN MECH. TUBING
SCALE - FULL



SHOULDER BUSHING - B

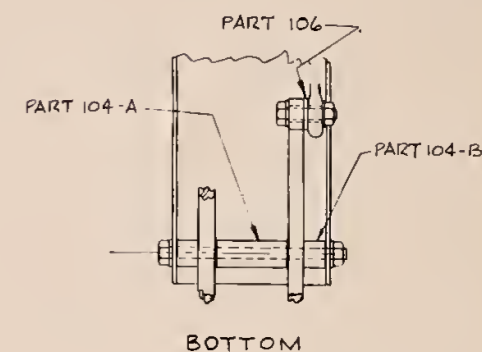
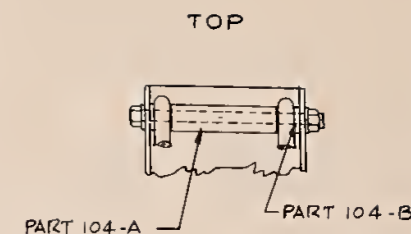


6 SHOULDER BUSHING

NO REQ'D - 2 MATERIAL - COLD DRAWN, STRESS PROOF
STEEL, 3/4" ROUND

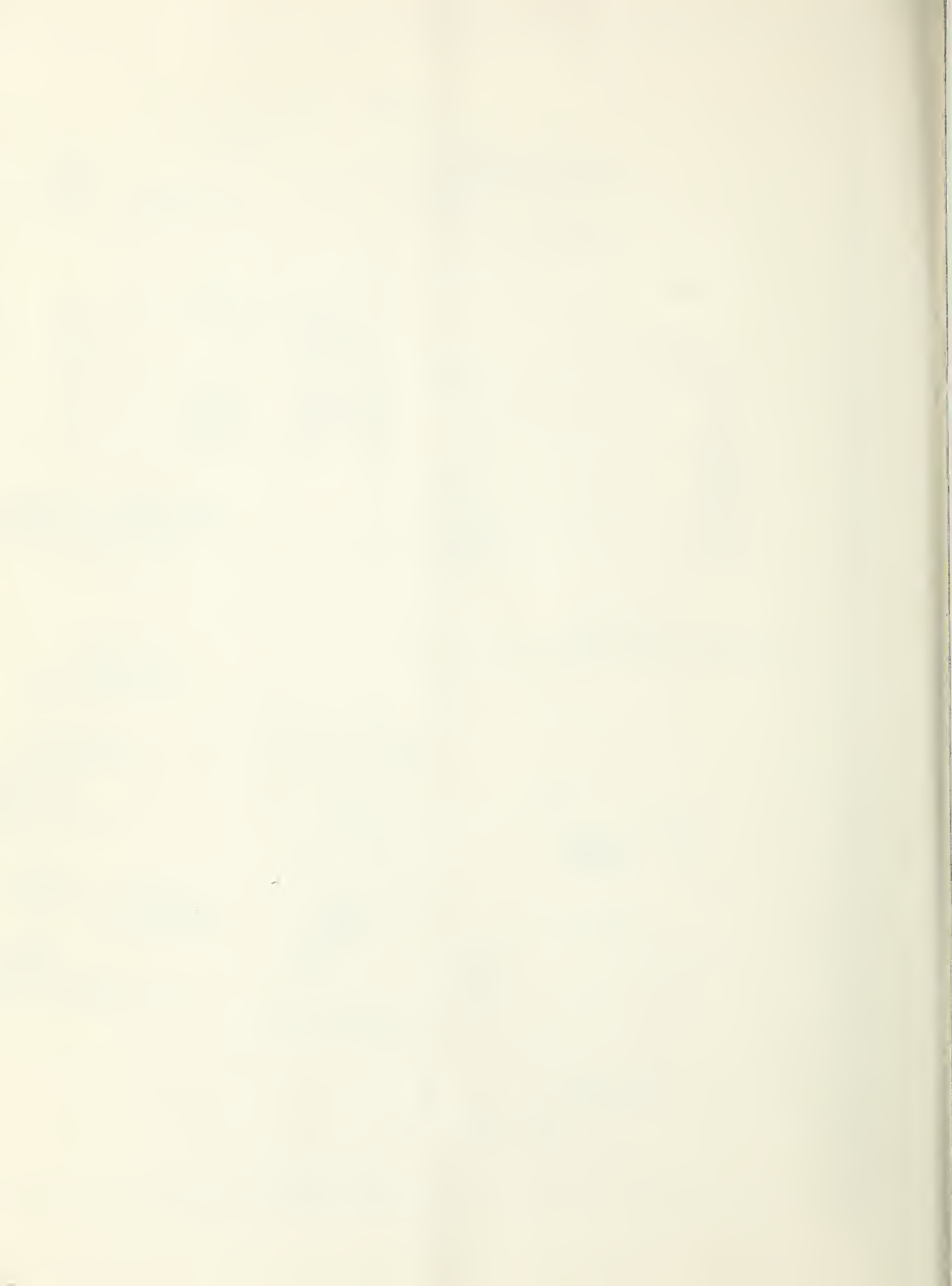
TOLERANCES AND FINISHES
A = ±.010 F = FINISH BY POLISHING
A+ = +.000 F = FINISH WITH FILE
- .010 F = FINISH BY GRINDING
A+ = +.010 F = FINISH BY ROUGH TOOL
- .000
D = NOT OVER NOR UNDER 1/16"
D+ = NOT OVER NOR MORE THAN 1/16" UNDER
D- = NOT UNDER NOR MORE THAN 1/16" OVER
ALSO B = 1/64" C = 1/32"
MAX. TOLERANCE ON FINISHED DIMENSIONS
OF D UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS AND SHARP CORNERS

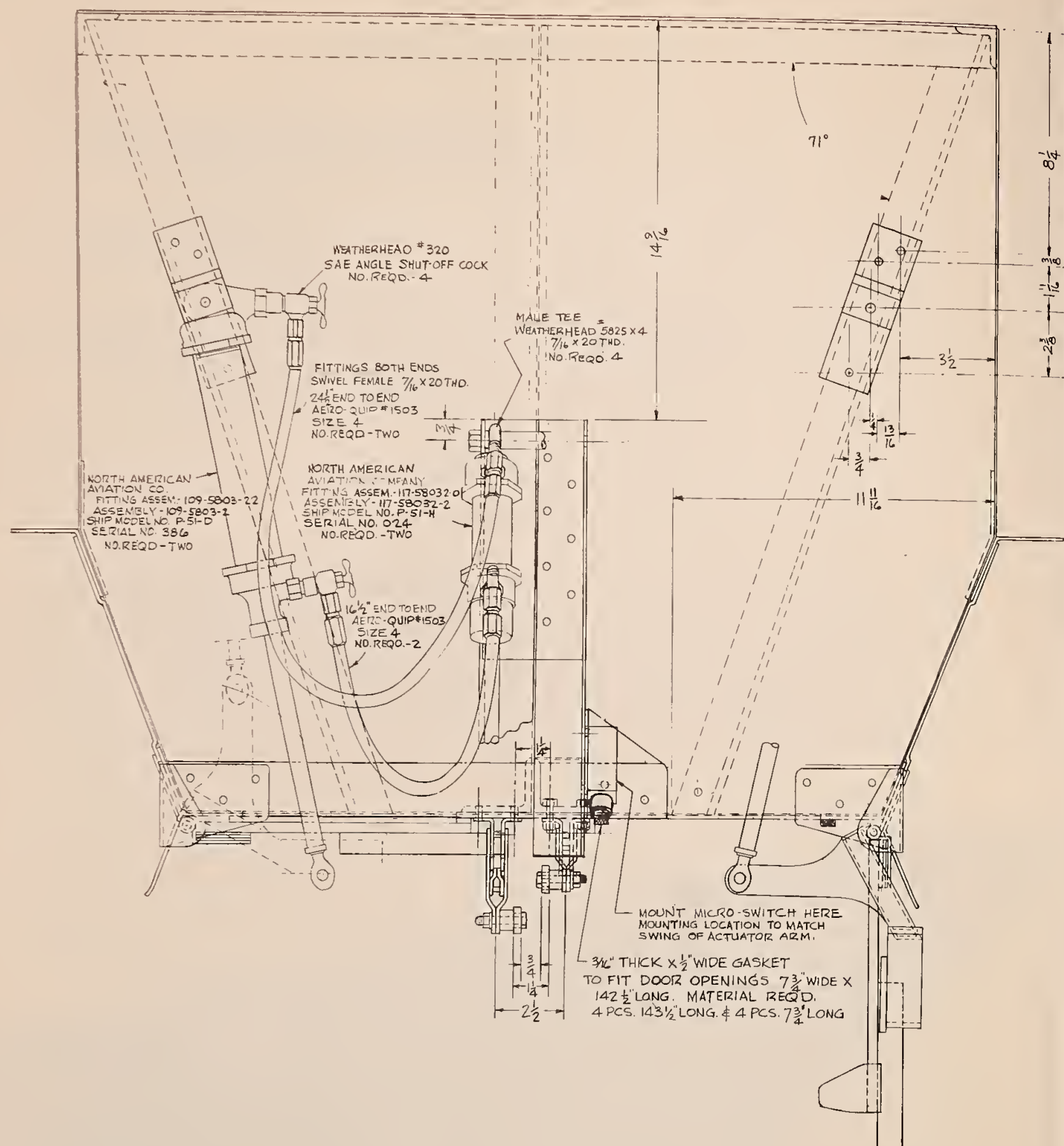
NOTE: MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
PREVIOUS OK FROM THE DESIGNING ENGINEER



SPACER LOCATIONS

SYMBOL	DATE	DESCRIPTION OF REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			
ARCADIA EQUIPMENT DEVELOPMENT CENTER			
TANK FOR TBM AIR TANKER MISC. DETAILS			
DRAWN BY: JSC: MED CHECKED BY: JSC: MED			DRAWING NUMBER F-46-09
APPROVED: JSC: MED			SHEET 1 OF 10
SCALE: AS SHOWN DATE: 11-26-57			





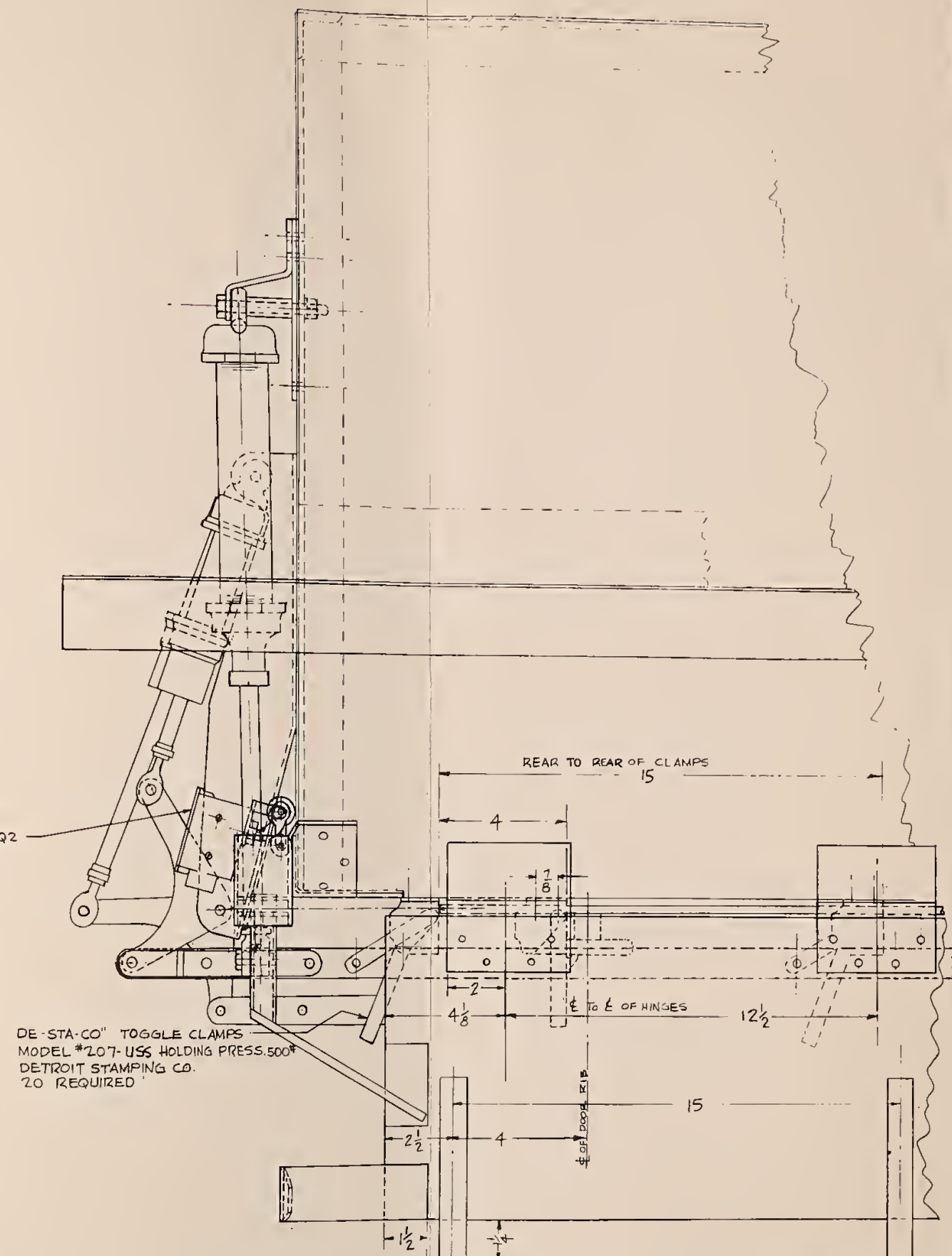
SIDE MOUNT
MICRO SWITCH
CAT NO. BZE-2RQ2
MINNEAPOLIS HONEYWELL
REGULATOR CO.
FREEPORT ILL.
NO. REQD. - TWO

MOUNT MICRO-SWITCH HERE
MOUNTING LOCATION TO MATCH
SWING OF ACTUATOR ARM.

3/16\"/>

NOTE :-

WHEN ANY OTHER TYPE AND MAKE OF HYDRAULIC
CYLINDERS ARE USED - PARTS AFFECTED WILL BE
F-46-066 F-46-072 F-46-076 F-46-077
F-46-094 F-46-095 F-46-096



DE-STA-CO\"/>

TOLERANCES AND FINISHES
A = ±.010 /s = FINISH BY POLISHING
A₁ = +.000 /s = FINISH WITH FILE
- .010 /s = FINISH BY GRINDING
A₂ = +.010 /s = FINISH BY ROUGH TOOL
- .000
D = NOT OVER NOR UNDER 1/16\"/>

NOTE MAKE NO SUBSTITUTION OF MATERIALS
NOR ALTERATIONS OF DIMENSIONS WITHOUT
PREVIOUS OK FROM THE DESIGNING ENGINEER

SYMBOL	DATE	DESCRIPTION OF REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE			
ARCADIA EQUIPMENT DEVELOPMENT CENTER			
TANK FOR TBM AIR TANKER DOOR MANIPULATION DETAILS			
DRAWN J.S.C. CHECKED T.G.		DRAWING NUMBER F-46-10	
APPROVED		DATE 12-11-57	
SCALE 1/4\"/>		SHEET 12 OF 12	

LITERATURE CITED

- (1) Arcadia Equipment Development Center
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Fire Control Notes 19(2): 63-65.
- (2) U. S. Forest Service
1958 AIR TANKER GUIDE
U. S. Forest Service Handbook - 5735.5, 42 pp.
- (3) Storey, Theodore G.; Wendel, George W.; and Altobellia, Anthony T.
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FOR FIGHTING FIRES.
Conference notes of Herbert J. Shields - Report of the Third
Agricultural Aviation Research Conference, Milwaukee,
Wisconsin, November 10-11, 1958: 61-67, U.S.D.A.



